The South African Stone Age Sequence updated (II)

Lombard, M.; Bradfield, J.; Caruana, M.V.; Makhubela, T.V.; Dusseldorp, G.L.; Kramers, J.D.; Wurz, S.

Discussion Forum

THE SOUTHERN AFRICAN STONE AGE SEQUENCE UPDATED (II)

MARLIZE LOMBARD[1*], JUSTIN BRADFIELD[1], MATTHEW V. CARUANA[1], TEBOGO V. MAKHUBELA[1,2], GERRIT L. DUSSELDORP[1,3], JAN D. KRAMERS[1,2] & SARAH WURZ[4,5]

[1]*Palaeo-Research Institute, University of Johannesburg, Auckland Park, Johannesburg, South Africa*
*(*Corresponding author. Email: mlombard@uj.ac.za)*

[2]*PPM Research Centre, Department of Geology, University of Johannesburg, Auckland Park, Johannesburg, South Africa*

[3]*Faculty of Archaeology, Leiden University, Leiden, the Netherlands*

[4]*School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand, Johannesburg, South Africa*

[5]*SFF Centre for Early Sapiens Behaviour (SapienCE), University of Bergen, Bergen, Norway*

(Received June 2022)

INTRODUCTION

A decade ago, we summarised the South African and Lesotho Stone Age technocomplex sequence as a heuristic exercise, anchored in 242 dated assemblages (Lombard *et al*. 2012). Following Clarke (1968), Sampson (1974) and Deacon (1980), we defined a technocomplex as a group of industries characterised by assemblages that have many, but not all, properties in common. Spatiotemporal changes and shifts in artefact design and frequencies owing to material use/availability and socio-economic factors are built into the framework. The accompanying dataset was intended to serve as a useful resource to both students and professionals, and to fuel research and debate.

The sequence served to contextualise lithic studies (Porraz *et al*. 2013; Ryano *et al*. 2017; Brenner & Wurz 2019; Low & Pargeter 2020) and, together with the accompanying human remains/fossil record (Dusseldorp *et al*. 2013), it proved useful for scholars working on a wide variety of topics. Among others, themes include subsistence behaviours (Sadr 2015; Dusseldorp 2016; Jerardino *et al*. 2016; Langejans *et al*. 2017), hunting strategies (Clark & Kandel 2013; Lombard 2021), archaeological theorising (Bousman & Brink 2018; Will & Mackay 2020; Dusseldorp & Lombard 2021), ancient DNA and fossil hominin evolution (Will & Stock 2015; Berger *et al*. 2017; Grine *et al*. 2017; Galway-Witham *et al*. 2019), and language, behavioural and cognitive evolution (Klein 2017, 2019; Schmidt *et al*. 2020).

The proposed sequence also increased the feasibility of interpreting aspects of open-air sites or undated/undatable assemblages (Mackay *et al*. 2014; Steele *et al*. 2016; Lotter & Kuman 2018; Ames *et al*. 2020; Caruana *et al*. 2020; Watson *et al*. 2020), and troubleshooting dating dilemmas (Nami *et al*. 2016; Loftus *et al*. 2019; Ecker *et al*. 2017; Van Couvering & Delson 2021; Pazan *et al*. 2022). It proved a useful background for alternative chronological proxies such as rainfall, vegetation, fauna and other climatic controls (Loftus *et al*. 2015; Chase *et al*. 2018; Jerardino *et al*. 2018; Robinson & Wadley 2018; Morrissey *et al*. 2020; Puech *et al*. 2021; Wurz 2021; Herbert & Fitchett 2022). Although it was specific to South Africa and Lesotho, its geographic reach proved much wider (Dibble *et al*. 2013; Douze & Delagnes 2016; Ossendorf 2017a; Bicho *et al*. 2018; Niekus *et al*. 2019; Tryon 2019; Shipton *et al*. 2021).

OUR APPROCH TO THIS UPDATE

Again, we use only dated assemblages to confine the sequence, but now also include open-air assemblages, and assemblages from Namibia, Botswana, Zimbabwe, eSwatini and Mozambique. Definitions for the technocomplexes remain intact (Table 1), but we made minor adjustments in nomenclature:

- We return to the use of the informal post-Howiesons Poort, instead of a formal Sibudu technocomplex, because the latter has not gained general traction.
- We exclude the pre-Still Bay as a separate technocomplex because, where it was scrutinised, it was found not to differ statistically significantly from the Still Bay (Lombard *et al*. 2019).
- We exclude the Klasies River (MSA l) as technocomplex because thus far too few assemblages have been identified as such.
- Informed by recent work (Chazan 2015; Eltzholtz 2020; Kuman *et al*. 2020; Richard *et al*. 2020), we use the formal Fauresmith instead of the informal ESA-MSA transitional technocomplex.

For this update, we gathered data from 450 assemblages, resulting in more than 1200 age estimates (Appendix A). Most of these dates have mean, as well as maximum and minimum values, resulting in more than 3700 datapoints with which to assess the progression of key trends in the southern African Stone Age sequence. Where possible, we re-calibrated the radiocarbon dates following the most recent calibration curve for the southern hemisphere, SHCal20 (Hogg *et al*. 2020), listing only the range of the largest intercept, not the full 95.4% range for each date. Correcting marine shell and ostrich eggshell radiocarbon calibrations for material-specific effects, however, fell outside the scope of this contribution. We again include marine isotope stages (MISs), but now also align the sequence to climatic proxies from the Indian Ocean of southeastern Africa, spanning most of the sequence (Caley *et al*. 2018).

No concise overview can capture the richness and variability expressed over more than two million years of the southern African Stone Age, but it can highlight trends, overlaps, gaps and outliers. Because they stimulate problem-driven research, we consider 'sequential problems' such as overlaps, gaps and outliers equally or more important than the 'perfect fit'. In mentioning gaps and overlaps, it is also necessary to grapple with the realities of deep-time dating, which we touch upon in the sections below. We present the three Stone Age periods separately, before summarising the full sequence. The demarcations between periods and technocomplexes are, however, seen as porous, membrane-like partitions, because in any evolutionary context "there can be no hard and fast boundaries" between units that are "created in the process of study depending on what is being studied and why" (Davidson 2020: 36).

THE LATER STONE AGE (LSA) SEQUENCE

Orton (2014: 110) responded to our first update for the LSA by suggesting that, regardless of similarities, assemblages that are far away from type sites should not be grouped. He mentions an example of the Wilton being used as far afield as Somalia (Clark 1954). We cannot account for its use in eastern Africa, but we highlight that local hunter-gatherers had social networks with radii reaching ~100 km or more (Marshall 1976;

TABLE 1. *Summary of the general characteristics for the different technocomplexes in the southern African Stone Age sequence (also see Deacon 1984: Wadley 1993; Lombard* et al. *2012).*

Technocomplex	General characteristics
ceramic final Later Stone Age	Broadly similar to the final Later Stone Age but includes grit- or grass-tempered pottery. Stone tool assemblages are often microlithic, and in some areas dominated by long end-scrapers, but also include few backed microliths; in other areas formal tools are absent or rare. Grindstones are common. Ground stone artefacts, stone bowls and boat-shaped grinding grooves may occur. Ceramics can be coarse, or well-fired and thin-walled; sometimes with lugs, spouts and conical bases; sometimes with decoration; sometimes shaped as bowls. Ochre and ostrich eggshell (OES) are common, and metal objects and glass beads may occur.
final Later Stone Age (regional variant: Smithfield)	Much variability can be expected. Variants include macrolithic assemblages that are mostly informal, often characterised by large, untrimmed flakes. Microlithic scrapers, blades and bladelets, backed tools and adzes may occur. Worked bone, oche, and OES are common. Metal objects are rare, and ceramics are absent.
Wilton	A fully developed microlithic tradition with numerous formal tools, highly standardised backed microliths often made from blades/bladelets and small convex scrapers. Ochre and OES are common, and bone, shell and wooden artefacts occur.
Oakhurst (regional variants: Albany, Lockshoek, Kuruman)	A flake-based industry characterised by round, end, and D-shaped scrapers and adzes and few or no microliths. A wide range of polished bone tools occur.
Robberg	Characterised by systematic bladelet production and the occurrence of *outils écaillés* or scaled pieces with significant numbers of unretouched bladelets and bladelet cores, and few formal tools. Some sites have a significant macrolithic element.
early Later Stone Age	Characterised by unstandardised, often microlithic, pieces and includes the bipolar knapping technique. Described at some sites, but not always clear whether assemblages represent an archaeological phase or a mixture of LSA and MSA artefacts.
final Middle Stone Age	Characterised by high regional variability in triangular flake and blade industries that may include, unifacial, bifacial and hollow-based points. Points are relatively short and stout. Some assemblages can be microlithic, include bipolar technology and backed geometric shapes such as segments and side scrapers.
post-Howiesons Poort	Most points are produced using the Levallois technique. Most formal retouch is aimed at producing unifacial points characterised by faceted platforms with somewhat elongated shapes compared to the final Middle Stone Age. Some side scrapers are present and backed pieces are rare.
Howiesons Poort	Characterised by blade technology although flake technology also occurs. It includes small (<4 cm) geometric backed tools, such as segments and trapezes, backed blades and scrapers. Some blades are denticulated and points are generally rare or absent, although some sites contain bifacial points. Bone points and engraved artefacts may occur.
Still Bay	Characterised by thin, bifacially worked foliate or lanceolate points with semi-circular or wide-angled pointed butts. Could include blades and finely serrated points. Sometimes include bone points, bone artefacts and shell beads.
Mossel Bay	Characterised by recurrent unipolar Levallois point and blade reduction. Products have faceted platforms, straight profiles and percussion bulbs are prominent and often splintered or ring-cracked. Formal retouch is infrequent, and include notches and scrapers. So-called Pietersburg assemblages share some features with the Mossel Bay.
early Middle Stone Age	Assemblages generally include discoidal and Levallois flake technologies, sometimes elongated with diffused bulbs, blades and a generalised toolkit. This phase needs future clarification regarding the designation of material culture and sequencing.
Fauresmith	Assemblages have large blades, points flaked using Levallois technology, and small bifaces/handaxes. Small picks, heavy- and light-duty denticulated and notched scrapers may occur. The Fauresmith includes the less well-described Sangoan variant.
Acheulean	Characterised by handaxes and cleavers (typically bifacially worked), large flake blanks (>10 cm), some with deliberate retouch sometimes classified as scrapers. Gives impression of being deliberately shaped but could indicate result of knapping strategy. Sometimes shows core preparation. Generally found in disturbed open-air locations.
Oldowan	Consists of cobble, core or flake tools with little retouch and no flaking to predetermined patterns. Hammerstones, manuports, cores and polished bone fragments/tools may occur.

Wiessner 1982; Wadley 1993). Within such systems, ideas originating anywhere on the landscape could spread from group to group across the subcontinent within a single human generation without groups/individuals travelling vast distances (Jerardino *et al*. 2014; Högberg & Lombard 2020). We therefore do not see distance as a disqualifier for using type-site designations.

In terms of lithic technology, Orton (2014) is also concerned about too much emphasis on similarity and not enough on variability. Yet, the purpose of a heuristic sequence is to summarise multi-faceted data to aid further learning, discovery, or problem-solving. It is best understood as a pragmatic 'shorthand' – instead of a detailed representation – that is both comprehensive and flexible enough to facilitate working with complex data when fine-grained explanations are either impossible or impractical. Differently scaled approaches serve

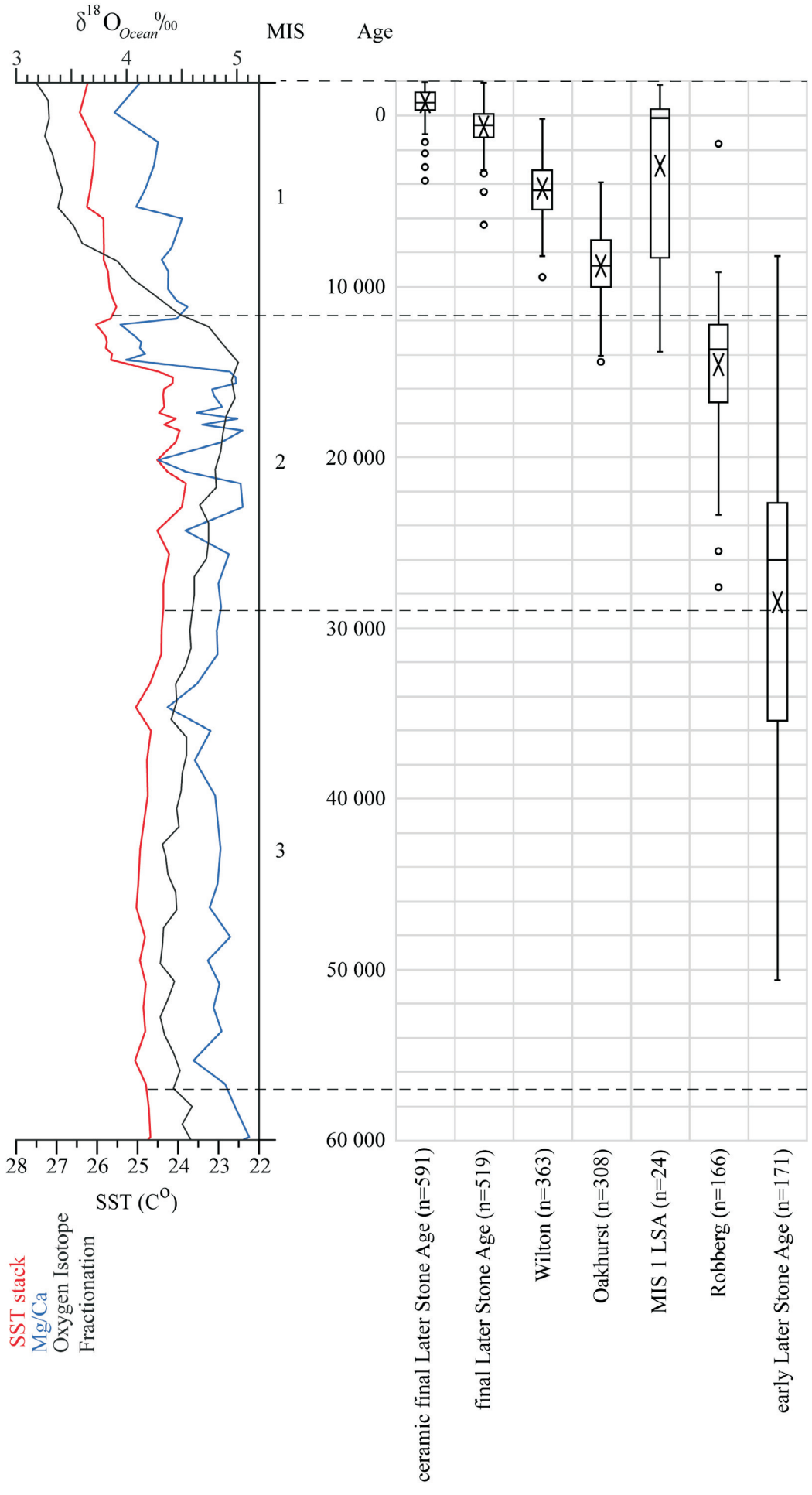

FIG. 1. *The Later Stone Age sequence in terms of technocomplexes and marine isotope stages, with MIS1 LSA representing assemblages that have not been identified/interpreted to fit within a named technocomplex.* n = *datapoints (minimum, average, and maximum estimates) per published date. Sea surface temperature (SST Stack and Mg/Ca) and isotope data from* Caley et al. *(2018).*

to highlight different aspects of the archaeological record. For example, the purpose of a synthesised sequence is to highlight broad spatiotemporal trends, whereas variation is best addressed through finer scaled intra- or inter-assemblage comparisons (Wadley & Mohapi 2008; Archer *et al*. 2015; Soriano *et al*. 2015; Lombard *et al*. 2019). Orton's (2014) proposed alternative for the LSA sequence is as follows: late Holocene assemblages post-3000 BP, Holocene microlithic post-8000 BP, Terminal Pleistocene/early Holocene non-microlithic 7000–12 000 BP, late Pleistocene microlithic 9500–19 000 BP and early LSA pre-18 000 BP. It has not been demonstrated how this scheme helps to better understand variation, and it still lacks data-driven assessment of its applicability.

Where assemblages have been interpreted or assessed (based on their descriptions) in terms of the technocomplexes, the current data demonstrate a relatively well-sorted LSA sequence, especially during MIS1 (Fig. 1). We suggest that the bars in Fig. 1 represent the general duration of the main expressions of these technocomplexes, and that the 'thin-data' overlaps potentially indicate transitional phases that require further investigation to understand shifts in techno-behavioural trends that may or may not correlate with ecological changes (see discussion on environmental determinism in Fekadu 2014; Arponen *et al*. 2019). During the LSA, the Robberg technocomplex stands out as a probable techno-behavioural response to the climatic fluctuations that occurred during the second half of MIS2 (also see Porraz *et al*. 2016; Chase *et al*. 2018; Pargeter *et al*. 2018; Loftus *et al*. 2019).

THE MIDDLE STONE AGE (MSA) SEQUENCE

Conard and Porraz (2015: 127) followed Orton's discussion with their commentary on the Middle Stone Age, arguing that chronological syntheses relying on the stratigraphic layering and dating of the Still Bay and Howiesons Poort at deep-sequence sites require revision. Using Diepkloof as example, they highlight that different age ranges were proposed by different laboratories for the same industries (Jacobs, Roberts *et al*. 2008; Tribolo *et al*. 2013; Jacobs & Roberts 2017). It is our view that, rather than a 'sequential' problem, such discrepancies likely represent complex interplay between varying approaches to dating, assemblage categorisation, site taphonomy and interpreting Pleistocene human behaviour. Simply put, regardless of age, and wherever present at the same site, the Howiesons Poort always follows on the Still Bay, which always follows on Levallois-type assemblages such as the Mossel Bay (Fig. 2). Thus, the relative sequence remains uncompromised.

The optically stimulated luminescence (OSL) method is mostly used for Still Bay and Howiesons Poort age estimates, but the method still has problems that can occur at any stage of the work (from sampling to interpretation). For example, accurate determination of the natural radiation levels at the precise sampling site is essential. This can be done by gamma (γ) spectrometry (targeting potassium (K), U and Th), *in situ* and/or on samples of the material in which the sample was embedded, chemical/isotope analysis, or a combination of these techniques. A recurrent problem with γ spectrometry is that U is often not detected or is underestimated (due to radon loss), which leads to an overestimation of the OSL age. The best way to solve potential problems is to combine gamma spectrometry with U/Th disequilibrium studies on the samples (Dirks *et al*. 2017).

Our analysis shows a well-sorted sequence for the post-MIS5 MSA (Fig. 2). It reveals overlaps between ~90 ka and 70 ka. These overlaps may indicate that:

- Different researchers define assemblages differently, sometimes without assessing them against the broad techno-complex criteria (Table 1), and often without publishing descriptions/data that enable such assessment.
- Human socio-technical behaviour in southern Africa was highly variable during this phase.
- Dating inconsistencies impact on the resolution of the sequence.

Regardless of cause/s, this phase requires more intense scrutiny (Porraz *et al*. 2018; Jacobs *et al*. 2020; Lombard *et al*. 2019; Wilkins 2020; Högberg & Lombard 2022; Pazan *et al*. 2022), as does the informally named early MSA currently spanning MIS6–8 (Fig. 2).

Following Shea's (2014) call to 'sink the Mousterian', Wilkins (2020) suggested the 'retirement' of the type-site naming tradition of southern African stone tool industries but acknowledged the lack of a better solution. She ties the custom to the culture history paradigm, despite researchers not using the sequence in that context. She also queries the use of the same name for a technocomplex (a regional spatiotemporal trend) and an industry (a site-specific or local expression of a regional technocomplex). To clarify, the Howiesons Poort is a technocomplex with wide distribution across southern Africa, but it is one of several MSA industries at Sibudu Cave where it has at least three recognised phases varying through time (Fig. 3). In Figure 3 we illustrate how the detection of spatiotemporal variation and subtle technological change is facilitated within the technocomplex system (contra Wilkins 2020).

Wilkins' (2020) alternative of examining lithic variability against the MIS scale relies heavily on the finality and accuracy of chronometric dating, even though such methods are not always exact, feasible or possible. Date ranges and climate proxies may give some resolution, but they are not absolute, with standard errors often spanning thousands of years. For example, advances in the precision and accuracy of $^{40}Ar/^{39}Ar$ dating are exemplified by the dating of the last Mt Toba eruption to 75 ± 0.9 ka at one standard error (Mark *et al*. 2014). Depending on the argument, the estimate may appear precise enough, but it implies that there is only a ~67% chance that the eruption happened sometime between 75.9 ka and 74.1 ka. This spread represents 1800 years, or 72 human generations at ~25 years per generation. Doubling the standard error increases the probability that the eruption happened between 76.8 ka and 73.2 ka to ~95%, but now the possible span becomes 2700 years, or 108 human generations during which the event may have occurred.

If OSL age estimates, with their own uncertainties/inaccuracies, are then used to infer contemporaneity with the Mt Toba eruption or each other, the possible spread in real time or human generations may stretch or shrink. In some instances, such correlation perhaps provides local resolution (Wilkins 2020) – but this inference still lacks critical assessment. Moreover, the abundance of tephra is frequently very low, and this may lead to challenges (Smith *et al*. 2019). Such correlations have not yet revealed new subcontinental socio-technical trends, nor do they provide a robust alternative for the southern African Stone Age sequence.

THE EARLIER STONE AGE (ESA) SEQUENCE

Many ESA sites and assemblages remain undated, but the advent of multicollector inductively-coupled plasma mass spectrometry (MC-ICP-MS) enables the analysis of small speleothem samples with low uranium contents, widening the scope of uranium-thorium (U/Th) disequilibrium dating of speleothems (Cheng *et al*. 2013). Although the age limit of U/Th

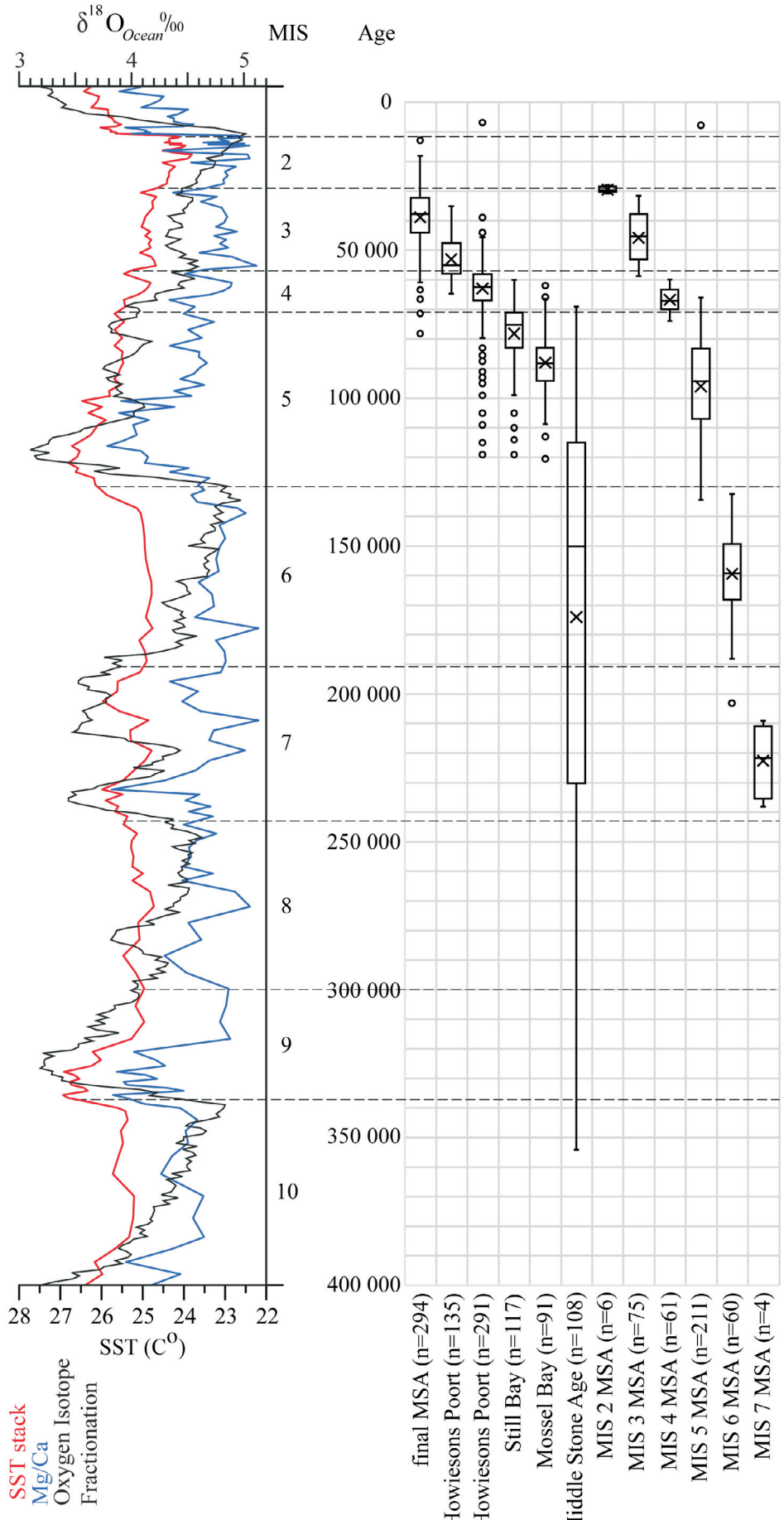

FIG. 2. *The Middle Stone Age sequence in terms of technocomplexes and marine isotope stages, with MIS2–7 MSA representing assemblages that have not been identified/interpreted to fit within a named technocomplex. n = datapoints (minimum, average, and maximum estimates) per published date. Sea surface temperature (SST Stack and Mg/Ca) and isotope data from* Caley et al. *(2018).*

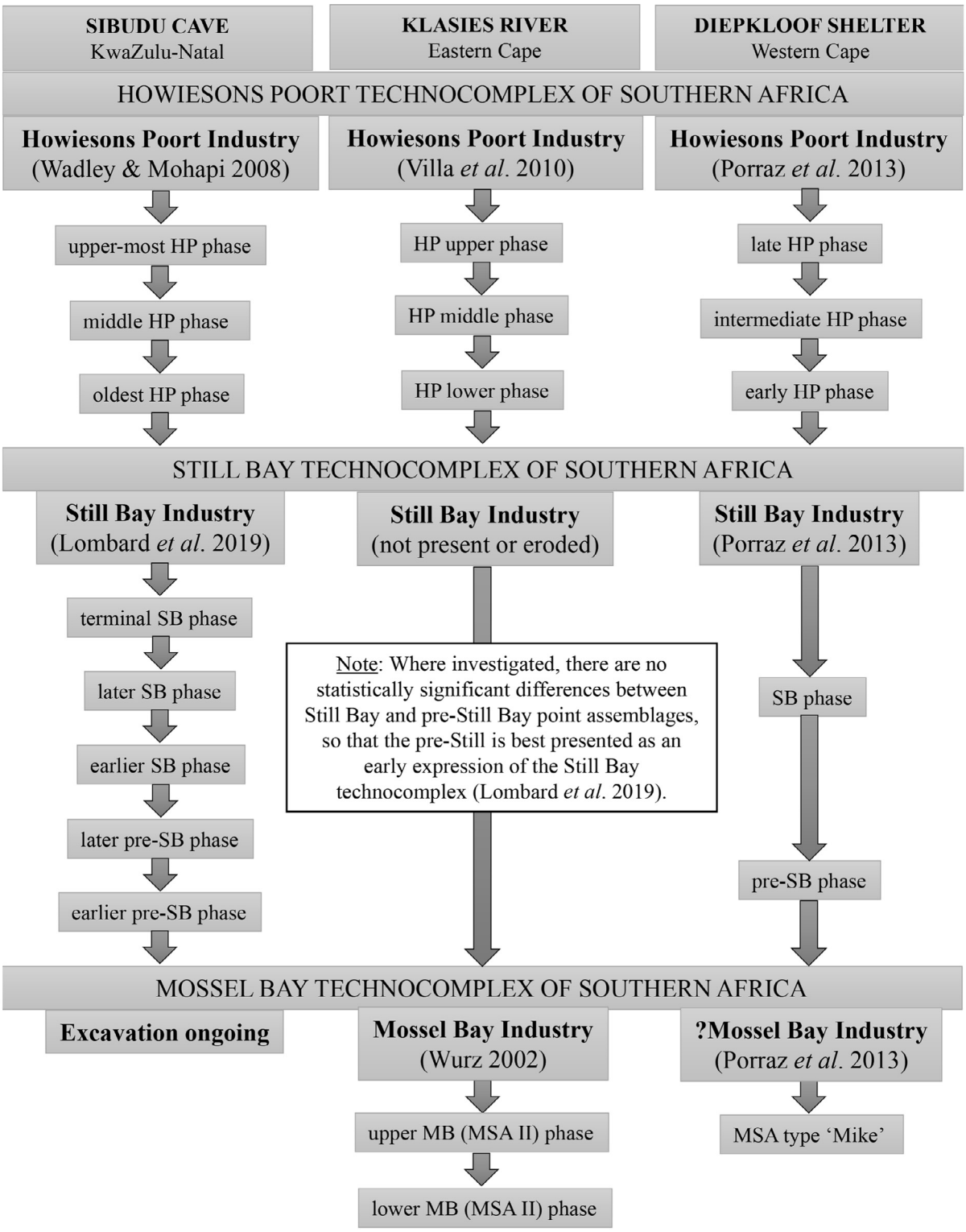

FIG. 3. *Explanation of how the same names apply to both technocomplexes and industries, and how depending on question and scope of research, fine-grained observations regarding spatiotemporal variability becomes possible within the technocomplex system. Similar to other taxonomies, a '?' before a name would indicate similarity, but uncertainty pending further analysis.*

dating remains confidently at ~500 ka, it can be stretched to ~700 ka (Cheng *et al*. 2013). Usually, ^{234}U is found to have been initially present in excess of $^{234}U/^{238}U$ equilibrium. This initial disequilibrium reduces to non-measurable levels only after about 3 Ma and can thus be corrected for in U/Th dating, as well as in U–Pb and uranium-thorium-helium ((U,Th)-He) dating of samples younger than 3 Ma (Makhubela & Kramers 2022).

For ages younger than 2 Ma, where the initial excess of ^{234}U can be well constrained, a good consistency between uranium-lead (U–Pb), OSL and palaeomagnetism results has been demonstrated (Pickering *et al*. 2013; Pickering & Edwards 2021). The U–Pb dating method has been applied successfully to older speleothems (Walker *et al*. 2006; Pickering *et al*. 2010; Pickering *et al*. 2013), and is particularly successful in combination with palaeomagnetism (Herries & Shaw 2011; Dirks *et al*. 2010). In the same family of methods, (U,Th)-He dating has been successfully tested on calcium carbonate speleothems

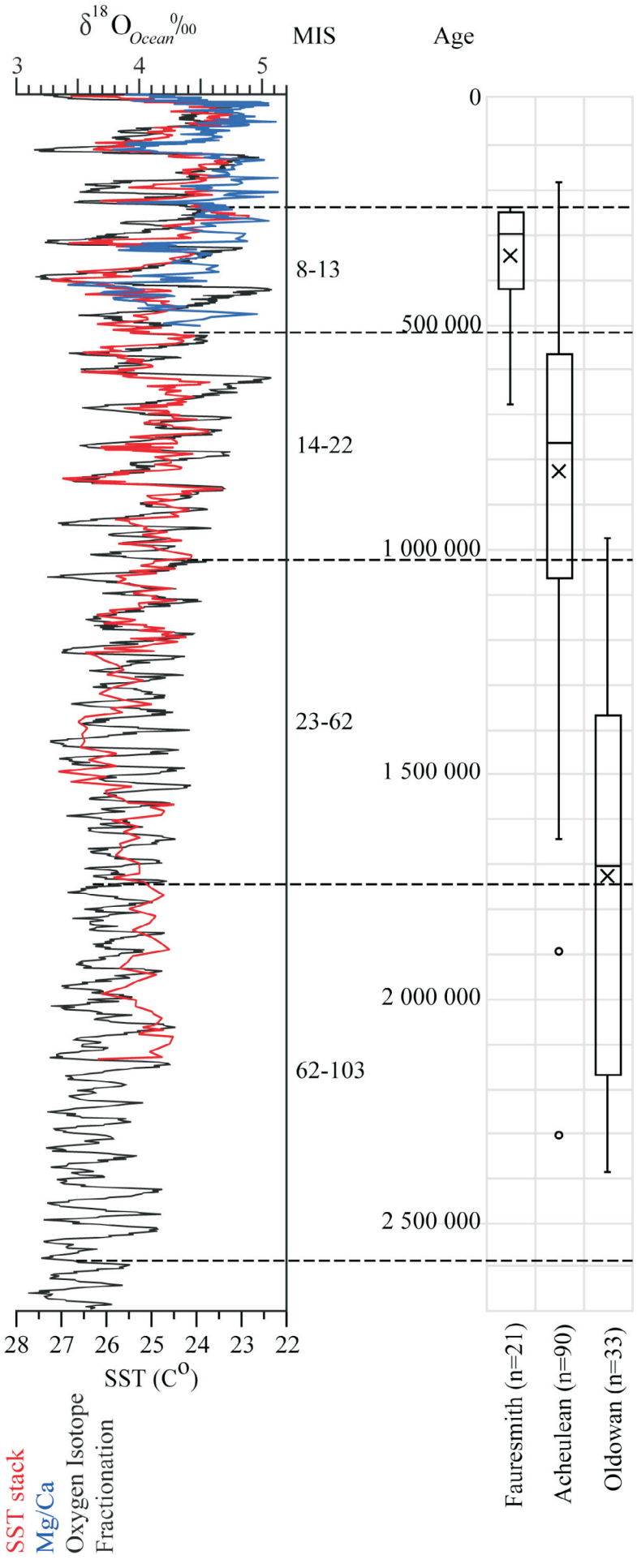

FIG. 4. *The Earlier Stone Age sequence in terms of technocomplexes and marine isotope stages.* n = *datapoints (minimum, average, and maximum estimates) per published date. Sea surface temperature (SST Stack and Mg/Ca) and isotope data from Caley* et al. *(2018).*

(Makhubela & Kramers 2022), holding promise in particular for 'dirty' and/or uranium-poor speleothems aged ≥100 ka.

Similar to OSL, Electron spin resonance (ESR) quantifies radiation-induced accumulated defects and further supplements the dating arsenal. ESR can be applied to dental apatite for the direct dating of fossils (Deino 2013). A further addition is the application of cosmogenic nuclides in determining erosion rates and surface exposure as well as burial times – in particular, beryllium-10 and aluminium-26 (^{10}Be and ^{26}Al) with half-lives of 708 ka and 1.39 Ma, respectively (Granger *et al*. 2013; Granger 2014). Lastly, in argon (^{40}Ar/^{39}Ar) dating of young volcanic rocks, which has been crucial in constraining the timeline for hominin evolution in eastern Africa, a new generation of multicollector noble gas mass spectrometers has increased the precision five-fold, leading to new perspectives in archaeological applications for this method (Schaen *et al*. 2021).

Despite the plethora of dating methods, numerous problems remain. For example, U–Pb dating on calcium carbonate speleothem samples associated with Little Foot (STW573, Sterkfontein Cave, Cradle of Humankind), initially yielded an age of 2.18 ± 0.10 Ma (Walker *et al*. 2006). Later it was found that the sample material came from intrusive veins rather than from flowstones (Bruxelles et al. 2014), resulting in a minimum age only. A subsequent multi-sample ^{26}Al/^{10}Be burial age determination yielded an age of 3.67 ± 0.16 Ma (Granger *et al*. 2015), but careful analysis of the data indicated that although some samples were in the cave for about 3.5 Ma, one of the samples could not have been underground for longer than ~2.8 Ma (Kramers & Dirks 2017a,b; Stratford *et al*. 2017). The problem with burial ages of clastic deposits in caves is thus heterogeneity and histories of burial prior to deposition at the present site.

Dating fossils in caves using the cosmogenic nuclides burial method thus tends to yield maximum ages. It is of course different for manuports and stone tools made of chert, which can be directly burial-dated *via* their cosmogenic nuclide content (Fujioka *et al*. 2022). But even for such samples there may be problems, particularly in a karst landscape where the dissolving of the bedrock created sinkholes, sinking streams, caves, springs, and other features. This is highlighted by a study on soils and chert clasts around the Rising Star cave site, where the soil quartz showed lower ^{26}Al/^{10}Be abundance ratios than expected at surface, attributed to long (up to 1 Ma) residence times of deep soil undergoing bioturbation (Makhubela *et al*. 2019). When sediments with such a complex exposure history are deposited in a cave, the burial ages can be overestimated and or underestimated, as is the case at Wonderwerk Cave (Shaar *et al*. 2021). This should be considered when using sediment burial ages to demarcate the upper age limits of lithic assemblages (Kuman *et al*. 2021).

If the ESA sequence is constrained to its three main technocomplexes, of which the Fauresmith probably represents a socio-technical transition into the MSA (Kuman *et al*. 2020), then sorting between the units is well-defined (Fig. 4). While some researchers have started to identify phases (variation) within the Acheulean such as early or late expressions (Leader *et al*. 2018; Li *et al*. 2018), it is not always clear whether these phases are identified based on technological trends (e.g. Lotter *et al*. 2021), or on where they occur in a sequence (Shaar *et al*. 2021).

THE UPDATED SEQUENCE IN CONCLUSION

With a larger number of numeric age estimates, we suggest that it is possible to refine the most probable durations for each of the recognised technocomplexes. In Table 2 we present the newly generated median ages (most unaffected by outliers)

TABLE 2. *Revised chrono-stratigraphic Stone Age sequence for southern Africa.*

Technocomplex	2012 suggested durations	Revised age estimates		
		Median age	Mean age ± SD	Most probable duration
LATER STONE AGE				
Expect variability between assemblages, a wide range of formal tools, particularly scrapers (microlithic and macrolithic), backed artefacts, evidence of hafted stone and bone tools, borers, bored stones, upper and lower grindstones, grooved stones, ostrich eggshell (OES) beads and other ornaments, undecorated/decorated OES fragments, flasks/flask fragments, bone tools (sometimes with decoration), fishing equipment, rock art, and ceramics in the final phase.				
ceramic final Later Stone Age	<2 ka	AD 774	AD 795 ± 698	AD 1493–97
final Later Stone Age	0.1–4 ka	546 BC	658 BC ± 1290	AD 632–1948 BC
Wilton	4–8 ka	4387 BC	4260 BC ± 1574	2686–5834 BC
Oakhurst	7–12 ka	8814 BC	8797 BC ± 2042	6755–10839 BC
Robberg	12–18 ka	13 705 BC	14 584 BC ± 3389	11 195–17 973 BC
early Later Stone Age	18–40 ka	25 998 BC	28 474 BC ± 8780	19 694–37 254 BC
MIDDLE STONE AGE				
General characteristics include Levallois or prepared core techniques in which triangular flakes with convergent dorsal scars, often with faceted striking platforms, are produced. Discoidal systems and intentional blade production from volumetric cores also occur. Formal tools may include unifacially and bifacially retouched points, backed artefacts, scrapers, and denticulates. Early traces of hafting are present, and marine shell beads, bone points, engraved ochre nodules, engraved OES fragments, engraved bone fragments, and grindstones are sometimes present.				
final Middle Stone Age	20–40 ka	37.7 ka	38.8 ± 8.9 ka	29.9–47.7 ka
post-Howiesons Poort	45–58 ka	55.1 ka	53 ± 6.6 ka	46.4–59.6 ka
Howiesons Poort	58–66 ka	62.4 ka	62.9 ± 11.4 ka	51.5–74.3 ka
Still Bay	70–77 ka	75.2 ka	78.1 ± 10.7 ka	67.4–88.8 ka
Mossel Bay	77–105 ka	88.2 ka	87.9 ± 10.5 ka	77.4–98.4 ka
early Middle Stone Age	130–300 ka	206.5 ka	196.5 ± 70 ka	126.5–266.5 ka
EARLIER STONE AGE				
Early stages include simple flakes struck from cobbles, core and pebble tools. Later stages include intentionally shaped handaxes, cleavers and picks. The final or transitional stages have tools that are smaller than the preceding stages and include large blades.				
Fauresmith	200–600 ka	305 ka	352.6 ± 118.9 ka	233.7–471.5 ka
Acheulean	300 ka–1.5 Ma	770 ka	834.2 ± 402.6 ka	431.6 ka–1.23 Ma
Oldowan	1.5–2 Ma	1.61 Ma	1.63 Ma ± 546.5 ka	1.08–2.18 Ma

and most probable durations (mean ± SD) for each, showing how it differs from our previous interpretation of the sequence.

The purpose of this sequence is again to serve as up-to-date heuristic shorthand for communicating and learning about complex data and broad trends associated with the Stone Age of southern Africa. It does not automatically imply culture historical assumptions, nor does it assume a teleological understanding of evolutionary processes (biological or socio-technical). Instead, it provides a data-driven catalyst for future discussion and exploration by creating a template to situate large-scale techno-typological patterning within a chronological framework.

APPENDIX A

The southern African Stone Age sequence updated (II)

Note: Marine isotope stages are aligned with the averaged age estimates of the assemblages, so that minimum and maximum ages may fall outside the current isotope stage parameters.

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
/Hei-/komas (Vaalhoek), South Africa (Northern Cape)	1	>AD 1798 (Pta-5444), AD 1462–166 (Pta-5452), AD 1444–1630 (Pta-5458), AD 21–120 (Pta-5530)	ceramic final LSA	Webley 2001
≠Gi, Botswana	1	AD 1660–1823	LSA (similar to ceramic final LSA)	Helgren 1984
≠Gi, Botswana	5	77 ± 11 ka	MSA (mixed open-air?)	Kuman 1989; Brooks *et al*. 1990
Amanzi Springs (Area 1), South Africa (Eastern Cape)	11	398.7 ± 31.6 ka, 403.9 ± 23.4 ka	late Acheulean	Herries *et al*. 2022
Apollo 11, Namibia	2	13 631–13 246 BC (KIA-3591), 13 796–13 334 BC (KIA-35914), 11 5447–15 128 BC (KIA-35916)	Robberg	Vogelsang *et al*. 2010
Apollo 11, Namibia	2–3	29 085–27 185 BC (Pta-1032), 32 311–30 298 BC (KIA35917), 29.4 ± 1.4 ka, 30.1 ± 1.6 ka, 34 638–31 442 BC (KN-4068), 34 289–32 672 BC (Pta-1040), 34 957–32 617 BC (KN-1813), 37 135–34 377 BC (KN-2056)	late MSA I (consistent with final MSA)	Vogelsang *et al*. 2010
Apollo 11, Namibia	3	42 317–37 048 BC (KN-4069), 41 467–37 898 BC (KN-2115), 42 449–38 746 BC (KN-1869)	late MSA II	Vogelsang *et al*. 2010
Apollo 11, Namibia	3	43 926–42 686 BC (KIA55918), 42.9 ± 2.7 ka, 47 556–42 466 BC (Pta-1041), 55.9 ± 3.0 ka	late MSA III (consistent with post-Howiesons Poort/Sibudu)	Vogelsang *et al*. 2010; Jacobs & Roberts 2017
Apollo 11, Namibia	4	63 ± 6 ka, 63.2 ± 2.3 ka, 64.7 ± 2.8 ka, 66.3 ± 3 ka, 69 ± 7 ka	Howiesons Poort	Miller *et al*. 1999; Vogelsang *et al*. 2010; Jacobs & Roberts 2017
Apollo 11, Namibia	4	70 ± 2.9 ka, 70.7 ± 2.5 ka	Still Bay	Vogelsang *et al*. 2010; Jacobs & Roberts 2017
Atmar Farm (Sundays River), South Africa (Eastern Cape)	16	650 ± 120 ka	Acheulean	Lotter & Kuman 2018a
Balerno Main Shelter, South Africa (Limpopo)	1	AD 880–1073 (Pta-8614), AD 652–776 (Pta-8603)	ceramic final LSA	Van Doornum 2007
Balerno Main Shelter, South Africa (Limpopo)	1	AD 27–244 (Pta-7997), 211–51 BC (Pta-8609)	final LSA	Van Doornum 2007
Barberspan, South Africa (North West)	3	43.2 ± 5 ka	MSA	Caruana *et al*. 2020
Batlharos 1, South Africa (Northern Cape)	1	AD 1664–1815	LSA	Beaumont & Vogel 1989
Bernol Farm (Sundays River), South Africa (Eastern Cape)	34	1.14 ± 0.2 Ma	Acheulean	Lotter & Kuman 2018a
Bestwood 1, South Africa (Nothern Cape)	10	366 ± 32 ka	Fauresmith	Richard *et al*. 2020
Biesje Poort 2, South Africa (Northern Cape)	1	AD 1460–1661 (Pta-9505), AD 1030–1181 (Pta-9506), AD 416–605 (Pta-5578)	ceramic final LSA	Beaumont *et al*. 1995; Parsons 2008
Big Elephant Shelter, Namibia	1	AD 542–881 (UCLA-724B),	Similar to final LSA	Wadley 2012

Continued on p. 181

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
		802–412 BC (UCLA-724A), 826–514 BC (Pta-1556), 892–1054 BC (Pta-1558), 1442–1224 BC (Pta-1557)		
Blind River, South Africa (Eastern Cape)	5	<118 ± 7 ka	*Homo sapiens*	Wang *et al*. 2008
Blinkklipkop, South Africa (Northern Cape)	1	>AD 1810 (Pta-2841), AD 1721–1813 (Pta-2833), AD 1497–1699 (Pta-2839), AD 846–1022 (Pta-2840), AD 880–1022 (Pta-2835)	ceramic final LSA	Thackeray *et al*. 1983
Bloeddrift 23, South Africa (Northern Cape)	1	AD 1503–1595 (Pta-7942)	ceramic final LSA	Smith *et al*. 2001
Blombos Cave, South Africa (Western Cape)	1	AD 1625–1670 (Pta-6184), AD 116–364 (Pta-6185), AD 56–130 (Wk-25554)	ceramic final LSA	Henshilwood 2008
Blombos Cave, South Africa (Western Cape)	4–5	67 ± 7 ka, 68 ± 6 ka, 81 ± 10 ka, 69.0 ± 4.0 ka, 77.1 ± 4.1 ka, 71.5 ± 4.3 ka, 72.3 ± 3.8 ka, 73.7 ± 4.2 ka, 75.1 ± 3.2 ka, 77 ± 8 ka, 77.5 ± 3.8 ka, 82 ± 8 ka, 105 ± 9 ka	Still Bay (M1, M2 upper), *H. sapiens*	Grine *et al*. 2000; Grine & Henshilwood 2002; Tribolo *et al*. 2006; Henshilwood *et al*. 2011; Jacobs *et al*. 2020
Blombos Cave, South Africa (Western Cape)	4–5	71.0 ± 4.0 ka, 76 ± 7 ka, 77.4 ± 4.2 ka, 80.0 ± 7.8 ka, 82.9 ± 3.8 ka, 85.5 ± 4.3 ka	pre-Still Bay (M2 lower), *H. sapiens*	Grine & Henshilwood 2002; Jacobs *et al*. 2020
Blombos Cave, South Africa (Western Cape)	5	77.4 ± 6.5 ka, 81.5 ± 4.7 ka, 83.4 ± 3.8 ka, 84.7 ± 3.9 ka, 85.3 ± 4.0 ka, 85.9 ± 4.1 ka, 86.3 ± 4.2 ka, 86.3 ± 4.2 ka, 88.0 ± 3.9 ka, 88.2 ± 5.3 ka, 88.7 ± 4.2 ka, 89.1 ± 5.1 ka, 90.9 ± 4.3 ka, 92.1 ± 4.6 ka, 93.2 ± 4.3 ka, 93.3 ± 4.1 ka, 94.0 ± 5.6 ka, 94.9 ± 4.8 ka, 99.3 ± 5.0 ka, 100.9 ± 4.6 ka, 108.7 ± 11.8 ka	MSA M3 (Mossel Bay) *H. sapiens*	Grine *et al*. 2000; Grine & Henshilwood 2002; Tribolo *et al*. 2006; Henshilwood *et al*. 2011; Jacobs *et al*. 2020
Blombos Cave, South Africa (Western Cape)	5	100.3 ± 7.6 ka, 101.0 ± 6.0 ka, 110.2 ± 4.8 ka	MSA pre-M3	Jacobs *et al*. 2020
Blombosfontein 1, South Africa (Western Cape)	1	5926–5668 BC (Pta-6177)	Wilton	Henshilwood 2008
Blombosfontein 2, South Africa (Western Cape)	1	5727–5512 BC (Pta-6181)	Wilton	Henshilwood 2008
Blombosfontein 3, South Africa (Western Cape)	1	4996–4611 BC (Pta-6180)	Wilton	Henshilwood 2008
Blombosfontein 4, South Africa (Western Cape)	1	4620–4347 BC (Pta-6176)	Wilton	Henshilwood 2008
Blombosfontein 5, South Africa (Western Cape)	1	4461–4224 BC (Pta-6182)	Wilton	Henshilwood 2008
Blombosfontein 6, South Africa (Western Cape)	1	2142–1746 BC (Pta-6709), 2776–2451 BC (Pta-6178)	Wilton	Henshilwood 2008
Blombosfontein 7, South Africa (Western Cape)	1	1445–1196 BC (Pta-6179), 1458–1291 BC (Pta-6183)	final LSA	Henshilwood 2008
Blombosfontein 9, South Africa (Western Cape)	1	AD 1402–1510 (Pta-6187), AD 1026–1226 (Pta-6248)	ceramic final LSA	Henshilwood 2008
Boegoeberg 2, South Africa (Northern Cape)	3	44 242–46 709 BP (Pta-6956)	MSA	Klein *et al*. 1999; Dewar & Stewart 2016
Bokvasmaak 3, South Africa (Northern Cape)	1	>AD 1797 (Pta-4872)	ceramic final LSA	Beaumont *et al*. 1995; Parsons 2008
Boomplaas, Western Cape	1	AD 416–656 (UW-307), AD 340–557 (UW-337), AD 239–436 (UW-338)	ceramic final LSA	Deacon 1982, 1984
Boomplaas, South Africa (Western Cape)	1	52–242 BC (UW-336)	final LSA	Deacon 1982, 1984
Boomplaas, South Africa (Western Cape)	1	5480–5270 BC (UW-306)	Wilton	Deacon 1982, 1984
Boomplaas, South Africa (Western Cape)	1	8627–7807 BC (UW-410), 10 684–9889 BC (UW-411)	Oakhurst	Deacon 1982, 1984

Continued on p. 182

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Boomplaas, South Africa (Western Cape)	1–2	10 669–10 578 BC (OxA-33812), 11 911–11 649 BC (OxA-33811), 12 179–11 657 BC (Pta-1828), 13 151–12 159 BC (UW-412), 14 055–13 680 BC (Pta-2259), 16 042–14 592 BC (UW-301), 20 129–19 063 BC (Pta-3283)	Robberg	Deacon 1982, 1984; Pargeter *et al*. 2018
Boomplaas, South Africa (Western Cape)	2–3	20 066–19 486 BC (OxA-33815), 23 835–23 017 BC (Pta-2298), 23 940–23 179 BC (Pta-1810), 24 151–22 319 BC (UW-300)	early LSA	Deacon 1982, 1984; Pargeter *et al*. 2018
Boomplaas, South Africa (Western Cape)	3	31 220–30 320 BP (Pta-2268), 37 490–36 000 BP (Pta-2274), 38 370–34 980 BP (UW-304), 39 600–34 970 BP (Beta-33543), 39 690–37 890 BP (OxA-33818), 39 970–38 360 BP (Pta-2220), 40 130–36 350 (Pta-2219), 40 250–38 540 BP (OxA-33819)	late MSA	Deacon 1982, 1984; Pargeter *et al*. 2018
Boomplaas, South Africa (Western Cape)	3–4	35.2 ± 2.6 ka, 36 890–34 480 BP (Pta-2302), 44 ± 4 ka, 44 550–39 370 BP (Pta-1811), 61 210–46 880 BP (OxA-33820)	MSA	Deacon 1982, 1984; Pargeter *et al*. 2018
Boomplaas, South Africa (Western Cape)	4	56 ± 6 ka, 58 ± 3.7 ka, 64 ± 3.2 ka, 66.1 ± 13 ka	Howiesons Poort	Deacon 1978; Pargeter *et al*. 2018
Border Cave, South Africa (KwaZulu-Natal)	3	40 316-37 688 BC (Pta-423), 40 742–38 047 BC (Pta-422), 42 241–39 196 BC (Pta-4711), 42 267–40 532 BC (Pta-4880), 42 658–39 387 BC (Pta-4779), 42 862–39 606 BC (Pta-4744), 42 977–38 777 BC (Pta-4697), 43 591–38 900 BC (Pta-704), 46 773–38 746 BC (Pta-4793), 47 776–39 515 BC (Pta-4776)	early LSA	Beaumont & Vogel 1972; Beaumont *et al*. 1978; Vogel *et al*. 1986; Wadley 1993
Border Cave, South Africa (KwaZulu-Natal)	3	39 ± 4 ka, 47 ± 2 ka	late post-Howiesons Poort	Beaumont 1978; Grün *et al*. 2003
Border Cave, South Africa (KwaZulu-Natal)	4	60 ± 3 ka	early post-Howiesons Poort	Beaumont 1978; Grün *et al*. 2003
Border Cave, South Africa (KwaZulu-Natal)	4–5	56 ± 2 ka, 64.2 ka, 64 ± 3 ka, 72 ± 4 ka, 74 ± 4 ka, 74 ± 5 ka	epi-Pietersburg, *H. sapiens*	Beaumont 1994; Grün *et al*. 2003; d'Errico & Backwell 2016
Border Cave, South Africa (KwaZulu-Natal)	5	77 ± 2 ka	Pietersburg	Grün *et al*. 2003; Backwell *et al*. 2018
Border Cave, South Africa (KwaZulu-Natal)	5	113 ± 5 ka, 115 ± 8 ka	late Pietersburg	Beaumont 1978; Grün *et al*. 2003
Border Cave, South Africa (KwaZulu-Natal)	6	144 ± 11 ka, 161 ± 10 ka, 168 ± 5 ka, 183 ± 20 ka	early Pietersburg	Beaumont 1978; Grün *et al*. 2003
Border Cave, South Africa (KwaZulu-Natal)	7	227 ± 11 ka	MSA	Beaumont 1978; Grün *et al*. 2003
Brand se Baai, South Africa (Western Cape)	1	AD 1148–1288 (Pta-6050)	LSA (similar to ceramic final LSA)	Halkett *et al*. 1993
Brand se Baai, South Africa (Western Cape)	1	209–47 BC (Pta-6052), 591–387 BC (Pta-6049), 1228–922 BC (Pta-6051), 3346–3024 BC (Pta-6053)	LSA (similar to final LSA)	Halkett *et al*. 1993
Buffelskloof, South Africa (Western Cape)	1	2471–2021 BC (UW-341), 3993–3706 BC (Pta-1481), 6401–5967 BC (UW-340), 6427–6213 BC (Pta-1841)	Wilton	Opperman 1978
Buffelskloof, South Africa (Western Cape)	1	8286–7787 BC (Pta-1484), 11 941–11 536 BC (Pta-1805)	Oakhurst	Opperman 1978
Bundu Farm, South Africa (Northern Cape)	6	145.7 ± 16 ka	early MSA	Kiberd 2006

Continued on p. 183

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Bundu Farm, South Africa (Northern Cape)	8	245 ka	ESA/lower levels (Fauresmith)	Kiberd 2006
Bushman Rock Shelter, South Africa (Mpumalanga)	1–2	8931–8617 BC, 9160–8705 BC, 9687–9242 BC, 12 221–11 797 BC, 12 376–11 831 BC, 13 155–12 241 BC, 13 173–12 133 BC	Oakhurst	Sampson 1974
Bushman Rock Shelter, South Africa (Mpumalanga)	5	73 ± 6 ka, 91 ± 10 ka	upper Pietersburg	Porraz *et al*. 2018
Bushman Rock Shelter, South Africa (Mpumalanga)	5	75 ± 6 ka, 97 ± 10 ka	lower Pietersburg	Porraz *et al*. 2018
Buzz Shelter, South Africa (Western Cape)	1	3370–3017 BC (AA89911), 4358–4159 BC (AA89912)	Wilton	Orton *et al*. 2011
Byneskranskop 1, South Africa (Western Cape)	1	AD 1483–1690 (Pta-1864), AD 1383–1450 (Pta-1866), AD 23–250 (Pta-1865)	ceramic final LSA	Schweitzer & Wilson 1982
Byneskranskop 1, South Africa (Western Cape)	1	1775–1503 BC (Pta-1569)	final LSA	Schweitzer & Wilson 1982
Byneskranskop 1, South Africa (Western Cape)	1	2488–2140 BC (Pta-1571), 5320–4660 BC (UW-409), 5478–5202 BC (Pta-1772), 5563–5357 BC (Pta-1905), 6777–6394 BC (Pta-2347)	Wilton	Schweitzer & Wilson 1982
Byneskranskop 1, South Africa (Western Cape)	1	9315–9043 BC (Pta-1587)	Oakhurst	Schweitzer & Wilson 1982
Byneskranskop 1, South Africa (Western Cape)	2	13 719–12 331 BC (I-7948)	Robberg	Schweitzer & Wilson 1982
Canteen Kopje (Hutton Sands), South Africa (Northern Cape)	1	0.13 ± 0.01 ka, AD 1436–present	late Holocene Smithfield (consistent with final LSA)	Forssman *et al*. 2010; Chazan *et al*. 2013
Canteen Kopje (Hutton Sands), South Africa (Northern Cape)	1	11.3 ± 0.4	LSA (consistent with Oakhurst)	Chazan *et al*. 2013
Canteen Kopje (Pit 6), South Africa (Northern Cape)	36 or ≥51	1.2 ± 0.7 Ma, 1.51 ± 0.8 Ma, >1.51 Ma	early Acheulean	Leader 2014
Cave James, South Africa (Gauteng)	1	2464–2141 BC (Wits-1383)	final LSA	Wadley 1987, 1996a
Cave James, South Africa (Gauteng)	1	5230–4776 BC (Wits-1744)	Wilton	Wadley 1987, 1996a
Cave James, South Africa (Gauteng)	3	>29 000 bp (Wits-1386)	early LSA	Wadley 1987, 1993
Cave of Hearths, South Africa (Limpopo)	19	<780 ka	late Acheulean, *H. heidelbergensis* or archaic *H. sapiens*	Tobias 1971; Curnoe 2009; Latham & Herries 2009
Clarke's Shelter, South Africa (KwaZulu-Natal)	1	AD 406–596 (Pta-2973), AD 362–88 BC (Pta-2971)	ceramic final LSA	Mazel 1984a
Collingham Shelter, South Africa (KwaZulu-Natal)	1	AD 1277–1401 (Pta-5092), AD 663–881 (Pta-5408), AD 202–412 (Pta-5274), AD 125–380 (Pta-5096), AD 117–402 (Pta-5265), AD 107–265 (Pta-5098), AD 50–247 (Pta-5101)	ceramic final LSA	Mazel 1992
Cooper's Cave D, South Africa (Gauteng)	52	1.526 ± 0.088 Ma (refined age estimate)	ESA (Mode 1/Oldowan)	De Ruiter *et al*. 2009; Sutton *et al*. 2017
Cornelia-Uitzoek, South Africa (Free State)	27–31	0.99-1.07 Ma	Acheulean	Brink *et al*. 2012
Cunene, Namibia	7	223.8 ± 22.2 ka	early MSA	Nicoll 2010
De Hoop, South Africa (Free State)	1	2061–1749 BC (Pta-6785), 1128–818 BC (Pta-6787)	final LSA	Klatzow 2010
Depression Rock Shelter, Botswana	1	51 BC–AD 365, AD 1412–1670	ceramic final LSA	Robbins & Campbell 1989
Depression Rock Shelter, Botswana	1	11 819–9881 BC	Oakhurst	Robbins & Campbell 1989

Continued on p. 184

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Depression Rock Shelter, Botswana	2	14 457–12 818 BC	Robberg	Robbins & Campbell 1989
Depression Rock Shelter, Botswana	2	21 393–20 468 BC	Similar to early LSA	Robbins & Campbell 1989
Deurspring 16, South Africa (Western Cape)	1	991–802 BC (Pta-7129), 3340–3010 BC (Pta-6742), 4341–4041 BC (Pta-7132), 4453–4242 BC (Pta-6740)	Similar to final LSA	Jerardino *et al*. 2016
Diamond Shelter, South Africa (KwaZulu-Natal)	1	3796–3515 BC (Pta-3246)	Wilton	Mazel 1984a
Diana's Vow, Namibia	1	10 796–10 520 BC	Lockshoek (similar to Oakhurst)	Cooke 1979
Die Kelders, South Africa (Western Cape)	1	AD 425–559 (weighted mean), AD 370–773 (GX-1685), AD 202–657 (GaK-3955), AD 202–59 (GaK-3877), 53 BC–AD 204 (weighted mean), 1058–512 BC (GaK-3878)	ceramic final LSA	Schweitzer 1979, 1984; Deacon 1982; Sadr & Sampson 2006
Die Kelders, South Africa (Western Cape)	3	50.6 ± 4.6 ka, 50.7 ± 4.7 ka, 51. 4 ± 6 ka	late MSA (post-HP?), *H. sapiens*	Feathers & Bush 2000; Grine 2000; Schwarcz & Rink 2000; Thackeray 2000
Die Kelders, South Africa (Western Cape)	4–5	58.6 ± 5.4 ka, 67 ± 10 ka, 69.9 ± 6.5 ka, 70.3 ± 5.8 ka, 75.3 ± 6.8 ka, 79.7 ± 15.6 ka	middle MSA (Levallois & blades), *H. sapiens*	Feathers & Bush 2000; Grine 2000; Schwarcz & Rink 2000; Thackeray 2000
Diepkloof, South Africa (Western Cape)	3	43.6 ± 1.9 ka, 51.9 ± 2.3 ka	post Howiesons Poort, *H. sapiens*	Tribolo *et al*. 2013; Verna *et al*. 2013; Feathers 2015; Jacobs & Roberts 2017
Diepkloof, South Africa (Western Cape)	3–5	49.1 ± 2.2 ka, 52 ± 5 ka, 56.0 ± 2.5 ka, 57.5 ± 2.6 ka, 59.2 ± 2.7 ka, 60.8 ± 2.6 ka, 52 ± 5 ka, 61.6 ± 2.7 ka, 63.1 ± 3.9 ka, 65 ± 8 ka, 65.9 ± 3.0 ka, 72.7 ± 4.6 ka, 77 ± 8 ka, 79.4 ± 8.1 ka, 79.7 ± 5.8 ka, 83 ± 8 ka, 85 ± 9 ka, 105 ± 10 ka, 109 ± 10 ka	Howiesons Poort, *H. sapiens*	Tribolo *et al*. 2013; Verna *et al.* 2013; Feathers 2015; Jacobs & Roberts 2017
Diepkloof, South Africa (Western Cape)	4–5	65.1 ± 2.8 ka, 73.2 ± 5.9 ka, 76.5 ± 3.3 ka, 88.2 ± 4.4 ka, 88.4 ± 4.0 ka, 93.3 ± 4.4 ka, 109 ± 10 ka	Still Bay	Tribolo *et al*. 2013; Jacobs & Roberts 2017
Diepkloof, South Africa (Western Cape)	5	89 ± 9 ka	MSA/Jack	Tribolo *et al*. 2013
Diepkloof, South Africa (Western Cape)	5	100 ± 10 ka	pre-Still Bay	Tribolo *et al*. 2013
Diepkloof, South Africa (Western Cape)	5	100 ± 10 ka, 107 ± 11 ka	MSA/uncharacterised lower deposit	Tribolo *et al*. 2013
Dikbosch 1, South Africa (Northern Cape)	1	AD 425–60 (Pta-3412), AD 248–437 (Pta-3413)	ceramic final LSA	Humphreys & Thackeray 1983
Dikbosch 1, South Africa (Northern Cape)	1	1443–1119 BC (Pta-1065)	final LSA	Humphreys & Thackeray 1983
Dikbosch 1, South Africa (Northern Cape)	1	7057–6688 BC (Pta-3411)	Wilton	Humphreys & Thackeray 1983
Dikbosch 1, South Africa (Northern Cape)	2	13 042–12 173 BC (Pta-1067), 14 309–13 538 BC (Pta-1200), 14 670–13 904 BC (Pta-1288), 15 081–14 317 BC (Pta-1068)	Oakhurst	Humphreys & Thackeray 1983
Driekoppen, South Africa (Eastern Cape)	2	32 261–20 261 BP (GdTI-203)	Similar to early LSA	Wallsmith 1990
Driekoppen, South Africa (Eastern Cape)	3	45 661–33 661 BP (GdTI-204)	Consistent with late MSA	Wallsmith 1990
Driel Shelter, South Africa (KwaZulu-Natal)	1	AD 225–390 (Pta-1384)	ceramic final LSA	Maggs & Ward 1980
Drimolen, South Africa (Gauteng)	77	2.041 ± 0.24 Ma	*H. erectus*, *Homo* sp.	Keyser *et al*. 2000; Moggi-Cecchi *et al*. 2010; Herries *et al*. 2020

Continued on p. 185

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Drotsky's Cave, Botswana	1	4461–4050 BC	Similar to final LSA	Robbins *et al*. 1996
Drotsky's Cave, Botswana	1	11 073–10 812 BC, 12 098–11 785 BC	Oakhurst	Robbins *et al*. 1996
Duinefontein II, South Africa (Western Cape)	8	265 ± 48 ka, 272 ± 83 ka, 292 ± 55 ka	Acheulean	Feathers 2002
Dunefield Midden 1, South Africa (Western Cape)	1	AD 772–987 (Pta-6738), AD 771–901 (Pta-5031), AD 1380–1450 (Pta-7889), AD 1276–1396 (Pta-4799), AD 966–1185 (Pta-6732), AD 888–1024 (Pta-5070), AD 916–986 (Pta-6735), AD 635–888 (Pta-4801)	Consistent with ceramic final LSA	Orton 2004; Parkington 2013
Dunefield Midden 1, South Africa (Western Cape)	1	5533–4981 BC (IT-C-1905)	Group 3 assemblage (similar to Wilton)	Orton 2020
Dzombo Shelter, Botswana	1	AD 1810–present (OxA-27139), AD 1879–1928 (OxA-342860), AD 1668–1785 (OxA-27136), AD 1026–1160 (OxA-27138), 594–401 BC (OxA-27137)	Consistent with ceramic final LSA	Forssman 2014
Elands Bay Cave, South Africa (Western Cape)	1	AD 1462–1674 (Pta-1815), AD 674–776 (Pta-5595), AD 202–413 (Pta-5820)	ceramic final LSA	Orton 2004
Elands Bay Cave, South Africa (Western Cape)	1	200–98 BC (Pta-5810), 2885–2566 BC (Pta-5805)	final LSA	Orton 2004
Elands Bay Cave, South Africa (Western Cape)	1	2885–2566 BC (Pta-5805), 3110–2867 BC (Pta-5313), 7044–6569 BC (Pta-1872), 7081–6598 (Pta-1829), 7206–6694 (AA-5832), 7531–7136 (Pta-1871), 8231–7651 (Pta-5305)	Wilton	Mitchell *et al*. 1996; Parkington 2012
Elands Bay Cave, South Africa (Western Cape)	1	9232–8704 BC (Pta-868), 9253–8736 BC (Pta-5306), 9770–8731 BC (OxA-456), 9324–8775 BC (Pta-3086), 9811–9266 BC (Pta-2481), 10230–9237 BC (UW-193), 10386–8710 BC (Pta-2592), 10558–10022 BC (Pta-5336), 10791–10478 (Pta-5361), 10806–10479 BC (Pta-732), 10816–10486 BC (Pta-5369), 10839–10515 BC (Pta-737), 10963–10783 BC (AA-5833), 11222–10510 BC (OxA-478)	Oakhurst, *H. sapiens*	Soper 1974; Morris 1992; Mitchell *et al*. 1996; Orton 2004; Parkington 2012
Elands Bay Cave, South Africa (Western Cape)	2	11 494–11 208 BC (AA-5834), 11 232–10 789 (UW-192), 14 938–14 013 BC (Pta-4321), 13 568–11 841 (GaK-4338), 14 938–14 013 BC (Pta-4321)	Robberg	Soper 1974; Maggs 1977; Wadley 1993; Orton 2004
Elands Bay Cave, South Africa (Western Cape)	2	20097–19040 BC (Pta-5308), 22 903–21 835 BC (Pta-1597), 23 278–22 029 BC (Pta-5304)	early LSA	Parkington 1992; Wadley 1993
Elands Bay Cave, South Africa (Western Cape)	3	33 270 ± 430 bp, 35 ± 3 ka, 37 ± 3 ka	late MSA	Tribolo *et al*. 2016; Porraz *et al*. 2016
Elands Bay Cave, South Africa (Western Cape)	5–8	83 ± 14 ka, 227 ± 22 ka, 231 ± 20 ka, 249 ± 24 ka	early MSA	Tribolo et al. 2016; Porraz *et al*. 2016
Equus Cave, South Africa (Northern Cape)	1	590-349 BC (Pta-2452)	LSA (consistent with final LSA)	Vogel *et al*. 1986
Equus Cave, South Africa (Northern Cape)	1	3957–3700 BC (Pta-2789), 4370–4050 BC (Pta-2791), 6443–6211 BC (Pta-2495)	Wilton	Vogel *et al*. 1986

Continued on p. 186

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Equus Cave, South Africa (Northern Cape)	1	11 291–9931 BC (Pta-4051)	Oakhurst	Vogel *et al*. 1986
Equus Cave, South Africa (Northern Cape)	2	23660–22394 BC (OxA-4277), 18121–17251 BC ([no lab number]), 9756–8816 BC (AA-5826)	*H. sapiens*	Grine & Klein 1985; Scott 1987; Scott *et al*. 2022
Erb Tanks, Namibia	1	<5 ka	LSA (consistent with Wilton)	McCall *et al*. 2011
Erb Tanks, Namibia	3–5	45 ka, 60 ka, 65 ka, 85 ka	MSA (open-air mixed)	McCall *et al*. 2011
Falls Rock Shelter, Namibia	1	AD 1219–1404 (Wits-1100), AD 118–111 BC (Pta-2930), AD 60–259 (Pta-2927	LSA (similar to ceramic final LSA)	Kinahan 2018
Falls Rock Shelter, Namibia	1	3114–2873 BC (Pta-3122), 1769–1492 BC (Pta-3121)	LSA (similar to final LSA)	Kinahan 2018
Faraoskop Rock Shelter, South Africa (Western Cape)	1	111 BC–AD 217 (Pta-4955), 190 BC–AD 75 (Pta-4965), 190 BC–AD 30 (Pta-5283), 201 BC–AD 31 (Pta-5281), 232 BC–AD 28 (Pta-4964), 773–413 BC (Pta-4890), 3132–2893 BC (Pta-4809)	final LSA	Sealy *et al*. 1992; Manhire 1993
Faraoskop Rock Shelter, South Africa (Western Cape)	2	10 976–10 659 BC (Pta-4816), 11 650–11 221 BC (Pta-4817), 18 361–17 564 BC (Pta-4822)	Robberg	Manhire 1993
Fateng Tsa Pholo, Lesotho	1	5984–5752 BC (UGAMS-04668), 6068–5895 BC (UGAMS-04670)	Wilton	Arthur *et al*. 2018
Florisbad, South Africa (Free State)	5	121 ± 6 ka, 128 ± 22 ka	MSA	Grün *et al*. 1996; Kuman *et al*. 1999
Florisbad, South Africa (Free State)	6–8	133 ± 31 ka, 146 ± 15 ka, 157 ± 21 ka, 259 ± 35 ka, 279 ± 47 ka, 281 ± 73 ka	early MSA, archaic *H. sapiens*, *H. helmei* or *H. heidelbergensis*	Dreyer 1935; Grün *et al*. 1996; Bruner & Lombard 2020
Ga-Mohana, South Africa (Northern Cape)	2	16 389–16 175 BC	Robberg	Wilkins *et al*. 2020; Wilkins 2021
Ga-Mohana, South Africa (Northern Cape)	3	39 364–29 745 BC	early LSA	Wilkins *et al*. 2020; Wilkins 2021
Ga-Mohana, South Africa (Northern Cape)	3	30.9 ± 1.8 ka	final MSA	Wilkins *et al*. 2020
Ga-Mohana, South Africa (Northern Cape)	5	99.2 ± 7.7 ka, 103 ± 6.5 ka, 109.8 ± 5.7 ka	undescribed MSA	Wilkins *et al*. 2020
Gehle Shelter, South Africa (KwaZulu-Natal)	1	AD 1226–1323 (Pta-1381), AD 674–894 (Pta-3242)	ceramic final LSA	Mazel 1984b
Gladysvale (Internal deposits), South Africa (Gauteng)	7	255.30 ± 2.51 ka, 240.80 ± 15.97 ka, 255 ± 30.5 ka	(?archaic) *H. sapiens* hair	Backwell *et al*. 2009
Gladysvale (External deposits), South Africa (Gauteng)	16–18	626 ± 48 ka, 650 ± 63 ka, 779 ± 51 ka	Acheulean, *Homo* sp.	Schmid & Berger 1997; Lacruz *et al*. 2002
Goedgeloof C1/M1, South Africa (Eastern Cape)	1	1132–902 BC (Pta-4066)	final LSA	Binneman 2004/2005
Goergap 113 KR, South Africa (Limpopo)	1	AD 1485–1693 (Pta-5653), AD 1456–1643 (Pta-5511), AD 1386–1484 (Pta-5510), AD 1379–1446 (Pta-5213), AD 1268–1398 (Pta-5507), AD 1226–1329 (Pta-5512), AD 1098–1275 (Pta-5508)	final LSA	Van der Ryst 1998
Gondolin, South Africa (Gauteng)	64–62	1.78 Ma	*Homo* sp.	Menter *et al*. 1999; Adams *et al*. 2007
Good Hope Shelter, South Africa (KwaZulu-Natal)	1	198–51 BC (Pta-838)	ceramic final LSA	Cable *et al*. 1980

Continued on p. 187

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Good Hope Shelter, South Africa (KwaZulu-Natal)	1	5699–5394 BC (Pta-1480)	Wilton	Cable *et al*. 1980
Grassridge Rock Shelter, South Africa (Eastern Cape)	1	5211–4783 BC (Pta-2970), 5365–5005 BC (Pta-2713), 5370–5044 BC (Pta-2952), 5913–5538 BC (Pta-2949)	Wilton	Opperman 1988
Grassridge Rock Shelter, South Africa (Eastern Cape)	3	31.6 ± 2.5 ka, 34.3 ± 2.9 ka, 34.4 ± 3.6 ka, 35.3 ± 4.1 ka, 36.4 ± 3.4 ka, 37.6 ± 2.6 ka, 43.1 ± 4.8 ka	final-late MSA	Ames *et al*. 2020
Groot Kloof, South Africa (Northern Cape)	8	248 ± 37 ka	early MSA	Curnoe *et al*. 2006
Grootrif B, South Africa (Western Cape)	1	235–52 BC (Pta-4081), 542–147 BC (Pta-4098), 1324–1046 BC (Pta-4067)	LSA (similar to final LSA)	Jerardino & Navarro 2018a
Grootrif D, South Africa (Western Cape)	1	401–181 BC (Pta-4075), 763–400 BC (Pta-4085), 791–460 BC (Pta-4083), 935–745 BC (Pta-4060)	LSA (similar to final LSA)	Jerardino & Navarro 2018a
Grootrif G, South Africa (Western Cape)	1	AD 1286–1396 (Pta-4070), 570–344 BC (Pta-4055), 2468–2286 BC (Pta-8742)	LSA (similar to final LSA)	Jerardino & Navarro 2018a
Ha Makotoko, Lesotho	1	7546–7173 BC (Pta-5191), 8282–7780 BC (Pta-5192), 8712–-8287 BC (Pta-5204), 9770–9249 BC (Pta-5205)	Oakhurst	Mitchell 1993a; Mitchell & Arthur 2010
Ha Makotoko, Lesotho	2–3	28 047–27 527 BC (UGAMS-11595), 31 392–30 306 BC (UGAMS-11598)	final MSA	Mitchell & Arthur 2014
Ha Makotoko, Lesotho	3	41 171–40 697 BC (UGAMS-11596), 41 964–40 897 BC (UGAMS-8988), 42 201–40 361 BC (OxA-27317), >52 200 BC (OxA-27318)	late MSA	Mitchell & Arthur 2014
Ha Mokotoko, Lesotho	2	13 156–12 852 BC (UGAMS-11594)	Robberg	Mitchel & Arthur 2014
Ha Soloja, Lesotho	3	48 123–37 792 BC (Pta-741), 50 628–40 530 BC (Pta-771)	late MSA	Carter & Vogel 1974
Haalenberg, Namibia	3	40 100 ± 1630 bp (Pta-2115)	MSA (consistent with final MSA)	Vogel & Visser 1981
Hartman valley 95, Namibia	1	AD 1178–1277 (KN-5286), AD 596–774 (KN-4851), AD 577–659 (KN-5287)	LSA (similar to final LSA)	Vogelsang & Eichhorn 2011
Heuningneskrans, South Africa (Mpumalanga)	1	6221–5893 BC (Pta-112)	similar to Wilton	Porraz & Val 2019
Heuningneskrans, South Africa (Mpumalanga)	1	8642–8241 BC (Lj-3198), 9685–9241 BC (AA-8563)	consistent with Oakhurst	Porraz & Val 2019
Heuningneskrans, South Africa (Mpumalanga)	2	12 640–11 856 BC (Lj-3150), 14 034–13 351 BC (Pta-100)	consistent with Robberg	Porraz & Val 2019
Heuningneskrans, South Africa (Mpumalanga)	2	21 871–20 800 BC (LJ-3135), 27 630–26 316 BC (AA-8565) 22 761–21 348 BC (LJ-3136), 23 335–21 954 BC (LJ-3137), 24 575–23 839 BC (AA-6451), 26 787–24 896 BC (LJ-3138), 27 610–26 018 BC (AA-8565)	?early LSA/Robberg	Vogel & Marais 1971; Beaumont & Vogel 1972; Linick 1977; Beaumont 1981; Wadley 1993; Porraz & Val 2019
Heuningneskrans, South Africa (Mpumalanga)	2	29 317–27 965 BP (Pta-101)	final MSA	Vogel & Marais 1971; Porraz & Val 2019
Highlands Rock Shelter, South Africa (Eastern Cape)	1	1985–1739 BC (Pta-563), 3121–2882 BC (Pta-536)	final LSA	Deacon 1976
Hoedjies Punt, South Africa (Western Cape)	5	~130–100 ka	early MSA	Will *et al*. 2013; Tribolo *et al*. 2022
Hofmeyr, South Africa (Eastern Cape)	3	36.2 ± 2.2 ka	*H. sapiens* skull	Grine et al. 2007
Holkrans, South Africa (North West)	1	AD 1665–1895 (Beta-265301), AD 1225–1320 (Beta-304277),	LSA (consistent with ceramic final LSA)	Witelson 2016

Continued on p. 188

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
		AD 586–688 (Beta-304273), AD 195–344 (Beta-284941), 323–192 BC (Beta-265360)		
Hollow Rock Shelter, South Africa (Western Cape)	4–5	71 ± 3 ka, 73 ± 6 ka, 79.4 ± 8.1 ka	Still Bay	Högberg & Larsson 2011; Högberg & Lombard 2022; Feathers 2015
Hollow Rock Shelter, South Africa (Western Cape)	5	83 ± 3 ka, 87 ± 4 ka	Mossel Bay	Högberg & Larsson 2011; Högberg & Lombard 2022
Hololo Crossing, Lesotho	1	AD 1720–1813 (Pta-5411), AD 1439–1711 (Pta-5412)	post-Classic Wilton (consistent with final LSA)	Kaplan & Mitchell 2012
Hope Hill Shelter, South Africa (Gauteng)	1	3362–2856 BC (Wits-1565)	final LSA	Wadley 1989; Wadley & Turner 1987
iNkolimahashi Shelter, South Africa (KwaZulu-Natal)	1	AD 1461–1648 (Pta-7227), AD 1390–1456 (Pta-7459), AD 837–990 (Pta-7229), 1580 bp (Pta-7230), AD 410–602(Pta-7231)	ceramic final LSA	Mazel 1999
iNkolimahashi Shelter, South Africa (KwaZulu-Natal)	1	67 BC–AD 210 (Pta-7384), 776–453 BC (Pta-7232), 540–1048 BC (Pta-7234)	final LSA	Mazel 1999
Iron Pig Rock Shelter, South Africa (Mpumalanga)	1	>16000 cal BP to <9000 cal BP	Robberg	Bader *et al*. 2020
Jagt Pan 7, South Africa (Northern Cape)	1	AD 385–599 (Pta-4300), 766–391 BC (Pta4309), 1002–777 BC (Pta-4193)	final LSA	Beaumont *et al*. 1995; Parsons 2008
Jakkalsberg A, South Africa (Northern Cape)	1	AD 681–750 (Pta-6100), AD 649–883 (Pta-5958)	ceramic final LSA	Brink & Webley 1996; Webley 1997
Jakkalsberg B, South Africa (Northern Cape)	1	AD 632–775 (Pta-6101), AD 636–683 (Pta-6122)	ceramic final LSA	Brink & Webley 1996; Webley 1997
Jakkalsberg L, South Africa (Northern Cape)	1	1764–1418 BC (GX-32065)	final LSA	Orton & Halkett 2010
Jakkalsberg N, South Africa (Northern Cape)	1	3352–3009 BC (Pta-8496), 3659–3516 BC (GX-32754A), 3799–3635 BC (GX-32755A)	Wilton	Orton & Halkett 2010
Jubilee Shelter, South Africa (North West)	1	AD 699–774 (Wits-1399), AD 465–640 (Wits-1381), AD 116–364 (Wits-1398)	ceramic final LSA	Wadley 1987
Jubilee Shelter, South Africa (North West)	1	1640–906 BC (Wits-1214), 1626–1376 BC (Wits-1449), 2236–1898 BC (Wits-1382), 2881–2440 BC (Wits-1450), 4336–3762 BC (Wits-1462)	Wilton	Wadley 1987, 1989
Jubilee Shelter, South Africa (North West)	1	8242–7027 BC (Wits-1436)	Oakhurst	Wadley 1987
Kabeljous River Mouth 1A, South Africa (Eastern Cape)	1	AD 435–636 (Pta-3970)	ceramic final LSA	Binneman 2004/2005
Kabeljous River Mouth 2B, South Africa (Eastern Cape)	1	807–466 BC (Pta-3970)	final LSA	Binneman 2004/2005
Kabeljous River Shelter, South Africa (Eastern Cape)	1	766–391 BC (Pta-4614)	final LSA	Binneman 2006/2007
Kabeljous River Shelter, South Africa (Eastern Cape)	1	4725–4360 BC (Pta-4061)	Wilton	Binneman 2006/2007
Kangkara Cave, South Africa (Western Cape)	1	4266–4038 BC (Pta-2286), 5635–5367 BC (Pta-2287)	Wilton	Deacon 1982, 1984
Kangkara Cave, South Africa (Western Cape)	1	6389–5990 BC (Pta-2812), 8645–8276 BC (Pta-2307)	Oakhurst	Deacon 1982, 1984
Kangkara Cave, South Africa (Western Cape)	2	13 221–12 276 BC (Pta-782), 14 418–13 658 BC (Pta-782)	Oakhurst	Deacon 1982, 1984
Kassimatis, Mozambique	3	<38 532–34 716 BC (SR-72)	*H. sapiens*	Barradas 1965, 1967

Continued on p. 189

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Kasteelberg A, South Africa (Western Cape)	1	AD 576–773 (OxA-3865), AD 416–640 (Pta-8461), AD 341–602 (OxA-3864), AD 360–436 (Pta-8459), AD 335–414 (Pta-8462), AD 204–390 (Pta-3461), AD 66–362 (Pta-3711)	ceramic final LSA	Smith 1987; Sealy & Yates 1994; Sadr *et al*. 2003; Sadr 2004
Kasteelberg B, South Africa (Western Cape)	1	AD 1665–1895 (Pta-3737), AD 1136–1283 (Pta-3747), AD 1045–1270 (Pta-3787), AD 1042–1229 (Pta-3742), AD 829–990 (Pta-3994), AD 771–990 (Pta-3998), AD 656–894 (Pta-3995)	ceramic final LSA	Smith 1987; Sadr 2004
Kasteelberg D, South Africa (Western Cape)	1	AD 434–640 (Pta-8094), AD 423–607 (Pta-8090), AD 337–587 (Pta-8093), AD 324–536 (Pta-8091), AD 205–425 (Pta-8095)	ceramic final LSA	Sadr *et al*. 2003; Sadr 2004
Kasteelberg E, South Africa (Western Cape)	1	AD 203–416 (Pta-8450), AD 16–83 (Pta-8453)	ceramic final LSA	Sadr *et al*. 2003; Sadr 2004
Kasteelberg G, South Africa (Western Cape)	1	AD 423–607 (Pta-8735), AD 361–474 (Pta-8719), AD 331–524 (Pta-8436), AD 16–246 (Pta-8732), 195 BC–AD 65 (Pta-8725)	ceramic final LSA	Sadr *et al*. 2003; Sadr 2004; Sadr & Sampson 2006
Kasteelberg G, South Africa (Western Cape)	1	776–415 BC (Pta-8452), 792–456 BC (Pta-8446), 2476–2135 BC (Pta-8762)	final LSA	Sadr *et al*. 2003; Sadr 2004; Sadr & Sampson 2006
Kasteelberg G, South Africa (Western Cape)	1	3374–3011 BC (Pta-8769)	Wilton	Sadr 2004; Sadr & Sampson 2006
Kasteelberg M, South Africa (Western Cape)	1	776–407 BC (Pta-8431)	ceramic final LSA	Sadr *et al*. 2003
Kasteelberg N, South Africa (Western Cape)	1	AD 410–594 (Pta-8443), AD 201–387 (Pta-8441)	ceramic final LSA	Sadr *et al*. 2003
Kathu Pan 1, South Africa (Northern Cape)	8	291 ± 45 ka	early MSA	Porat *et al*. 2010
Kathu Pan 1, South Africa (Northern Cape)	12–14	464 ± 47 ka, 542 +140/-107 ka	Fauresmith (ESA-MSA transition?)	Porat *et al*. 2010
Kathu Pan 2, South Africa (Northern Cape)	1	AD 199–390, 1324–1004 BC, 3121–2882 BC	LSA (similar to final LSA)	Beaumont & Morris 1990; Wilkins 2021
Kathu Pan 2, South Africa (Northern Cape)	1	6421–6061 BC	LSA (similar to Wilton)	Beaumont & Morris 1990; Wilkins 2021
Kathu Pan 5, South Africa (Northern Cape)	2	22 528–21 112 BC (Pta-3586)	early LSA	Beaumont *et al*. 1984; Beaumont & Morris 1990; Wadley 1993
Kathu Pan 5, South Africa (Northern Cape)	3	31 270–27 839 BC (I-13040), 31 250–28 788 BC (Pta-3566), 32 ± 0.78 ka, 37 171–33 157 BC (Pta-3591)	final MSA	Beaumont & Morris 1990
Kathu Pan 6, South Africa (Northern Cape)	1	1688–1415 BC	LSA (similar to final LSA)	Beaumont & Morris 1990; Wilkins 2021
Kathu Pan 6, Northern Cape	1	2.3 ± 0.1 ka, 5.7 ± 0.3 ka	Wilton	Lukich *et al*. 2019
Kathu Pan 6, South Africa (Northern Cape)	3	55 ± 7 ka	Howiesons Poort (open probably mixed)	Lukich *et al*. 2019
Kathu Pan 6, South Africa (Northern Cape)	5	74 ± 5 ka, 76 ± 8 ka	Howiesons Poort/Still Bay	Lukich *et al*. 2019
Kathu Pan 6, South Africa (Northern Cape)	5	100 ± 6 ka	Howiesons Poort/Still Bay	Lukich *et al*. 2019
Kathu Pan 6, South Africa (Northern Cape)	5–8	80 ± 7 ka, 95 ± 6 ka, 106 ± 11 ka, 121 ± 6 ka, 123 ± 8 ka, 157 ± 11 ka, 169 ± 19 ka, 200 ± 11 ka, 275 ± 16 ka	early MSA	Lukich *et al*. 2019

Continued on p. 190

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Kathu Pan 8, South Africa (Northern Cape)	1	AD 678–880, 3382–3029 BC	LSA (similar to final LSA)	Beaumont & Morris 1990; Wilkins 2021
Kathu Pan 8, South Africa (Northern Cape)	1	7040–6569 BC	Wilton	Beaumont & Morris 1990; Wilkins 2021
Kathu Pan 9, South Africa (Northern Cape)	5	91 ± 5 ka	early MSA	Beaumont & Morris 1990; Lukich *et al*. 2019
Klasies River 1, South Africa (Eastern Cape)	4	56.3 ± 4.6 ka, 65 ka, 66.5 ± 4.8 ka, 70.7 ± 7.4 ka	MSA IV	Bada & Deems 1975; Feathers 2002; Nami *et al*. 2016
Klasies River 1, South Africa (Eastern Cape)	5	68.4 ± 6.5 ka, 70.9 ± 5.1 ka, 85.2 ± 2.1 ka, 88.3-93.5 ka, 89 ka, 94.6 ± 3.2 ka, 100.8 ± 7.5 ka, 101 ± 12 ka, <126.0 ± 1.5 ka; 106 ± 2.1 ka, 109.8 ± 0.97 ka, 110.06 ± 1.1 ka	Mossel Bay, *H. sapiens*	Bada & Deems 1975; Grün *et al*. 1990; Vogel 2001; Feathers 2002; Eggins *et al*. 2005; Deacon 2008; Millard 2008; Wurz *et al*. 2018; Grine *et al*. 2020; Wurz *et al*. 2022
Klasies River 1, South Africa (Eastern Cape)	5	90 ka, 110 ka, 106.8 ± 12.6 ka, 108.6 ± 3.4 ka	MIS 5 MSA (Klasies River), *H. sapiens*	Bada & Deems 1975; Vogel 2001; Feathers 2002; Deacon 2008
Klasies River 1A, South Africa (Eastern Cape)	3–4	43.4 ± 3.0 ka, 50.8 ± 6.6 ka, <52 ka, 57 ± 4 ka, 57.9 ± 2.3 ka, 59.3 ± 2.8 ka	post-Howiesons Poort, *H. sapiens*	Grün *et al*. 1990; Feathers 2002; Grine 2012; Millard 2008; Tribolo *et al*. 2013; Jacobs & Roberts 2017
Klasies River 1A, South Africa (Eastern Cape)	3–5	45.6 ± 6.7 ka, 46.7 ± 3.3 ka, 48 ± 4 ka, 50 ± 5 ka, 52 ± 4 ka, 52 ± 6 ka, 52 ± 8 ka, 53 ± 6 ka, 54 ± 6 ka, 54 ± 7 ka, 55 ± 5 ka, 55 ± 8 ka, 56 ± 7 ka, 58 ± 7 ka, 53-64 ka, 63.2 ± 2.7 ka, 65.6 ± 5.3 ka, >80 ka	Howiesons Poort, *H. sapiens*	Grün *et al*. 1990; Brooks *et al*. 1993; Vogel 2001; Feathers 2002; Eggins *et al*. 2005; Millard 2008; Grine 2012; Tribolo *et al*. 2013; Jacobs & Roberts 2017
Klasies River 1A, South Africa (Eastern Cape)	4–5	66.4 ± 6.1 ka, 77.4 ± 7.0 ka, 85 ± 8 ka	Mossel Bay, *H. sapiens*	Grün *et al*. 1990; Churchill *et al*. 1996; Vogel 2001; Deacon 2008; Tribolo *et al*. 2013
Klasies River 1A, South Africa (Eastern Cape)	5	71.8 ± 4.7 ka, 80.6 ± 17.6 ka	pre-Howiesons Poort	Feathers 2002; Jacobs & Roberts 2017
Klasies River 2, South Africa (Eastern Cape)	3–4	52.4 ± 4.0 ka, 63.3 ± 2.9 ka, 66.9 ± 3.3 ka	Howiesons Poort	Feathers 2002; Jacobs & Roberts 2017
Klasies River 2, South Africa (Eastern Cape)	4	69.9 ± 6.2 ka	pre-Howiesons Poort	Jacobs & Roberts 2017
Klein Kliphuis, South Africa (Western Cape)	3	32.6 ± 1.3 ka, 33.3 ± 1.3 ka	final MSA	Jacobs, Roberts *et al*. 2008; Mackay 2010; Jacobs & Roberts 2017
Klein Kliphuis, South Africa (Western Cape)	3–4	55.2 ± 2 ka, 55.6 ± 2.7 ka, 56.1 ± 2.4 ka, 57.8 ± 2.4 ka, 59.4 ± 2.5 ka, 60.4 ± 2.5 ka	post-Howiesons Poort	Jacobs, Roberts *et al*. 2008; Mackay 2010; Jacobs & Roberts 2017
Klein Kliphuis, South Africa (Western Cape)	4	59.1 ± 2.4 ka, 59.7 ± 2.7 ka, 62.6 ± 2.6 ka, 64 ± 2.8 ka, 64.7 ± 3 ka, 66.7 ± 3 ka, 68.2 ± 2.8 ka	Howiesons Poort	Jacobs, Roberts *et al*. 2008; Mackay 2010; Jacobs & Roberts 2017
Klipdrift Cave, South Africa (Western Cape)	1	9031–8816 BC (Beta-347865), 11 132–10 881 BC (Beta-347868), 11 658–11 451 BC (Beta-347866), 11 649–11 451 BC (Beta-347867), 11 832–11 629 BC (Beta-347869)	Oakhurst	Ryano *et al*. 2017
Klipdrift Shelter, South Africa (Western Cape)	3	51.7 ± 3.3 ka	post-Howiesons Poort	Henshilwood *et al*. 2014

Continued on p. 191

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Klipdrift Shelter, South Africa (Western Cape)	4	59.4 ± 4.6 ka, 60 ± 4.0 ka, 60.3 ± 3.8 ka, 63.5 ± 4.7 ka, 64.6 ± 4.2 ka, 65.5 ± 4.8 ka	Howiesons Poort, *H. sapiens*	Henshilwood *et al*. 2014; Harvati *et al*. 2015
Klipdrift Shelter, South Africa (Western Cape)	4	71.6 ± 5.1 ka	pre-Howiesons Poort?	Henshilwood *et al*. 2014
Klipgats Pan, South Africa (Northern Cape)	1	AD 991–1048 (UGAMS-21096), AD 1451–1509 (UGAMS-21095), AD 1396–1439 (UGAMS-21094), AD 1348–1390 (UGAMS-21093)	Similar to ceramic final LSA	Orton & Parsons 2018
Kliprandfontein, South Africa (Western Cape)	2	12 397–11 485 BC (DAMA-002439), 14 382–13 987 BC (DAMS-003797), 16 254–15 835 BC (DAMS-001839), 16 551–16 351 BC (DAMS-002440), 17 353–16 974 BC (DAMS-002441), 20 381–20 042 BC (DAMS-003800)	Robberg	Low & Mackay 2018; Low 2019
Knysna Heads, South Africa (Western Cape)	2	10 515–9245 BC (GrA-23223)	*H. sapiens*	Morris 1992; Stynder *et al*. 2007
Kreefbaai C, South Africa (Western Cape)	1	763–400 BC (Pta-3313), 767–407 BC (Pta-3589), 763–396 BC (Pta-4047), 1536–1258 BC (Pta-4045)	LSA (similar to final LSA)	Jerardino & Navarro 2018
Kruger Cave, South Africa (Gauteng)	1	AD 641–690 (Wits 1153), AD 967–1217 (Wits-1181)	final LSA	Mason 1988
Kruger Cave, South Africa (Gauteng)	1	4539–3901 BC, 5673–5313 BC, 5723–5315 BC, 5738–5467 BC, 831–5477 BC, 56452–6222 BC, 8487–7956 BC, 9261–8606 BC, 9405–8761 BC, 10 021–9316 BC, 10 551–9661 BC, 10 751–9810 BC	Oakhurst	Mason 1988
Kuidas Springs, Namibia	1	AD 573–642 (OxA- 27896), AD 1719–1814 (OxA-27891), AD 1726–1810 (OxA-27892), 383–188 BC (OxA-27894)	ceramic final LSA	Veldman *et al*. 2017
Leholamogoa, South Africa (Limpopo)	1	AD 1650–1819 (Beta-236646), AD 1617–1679 (Beta-236647)	ceramic final LSA	Bradfield *et al*. 2009
Leholamogoa, South Africa (Limpopo)	1	189–44 BC (Beta-236644), 210–39 BC (Beta-236645)	final LSA	Bradfield *et al*. 2009
Leliehoek, South Africa (Free State)	1	3804–3367 BC (Wits-2009), 4250–3757 BC (Wits-2010)	Wilton	Esterhuysen *et al*. 1994
Leopard Cave, Namibia	1	208–59 BC (Beta-270163), 673–381 BC (Beta-236963), 1541–1398 BC (Beta-236964), 1293–1047 BC (SocA42299)	Wilton preceramic LSA (similar to final LSA)	Mauran *et al*. 2020
Leopard Cave, Namibia	2	13 834–13 358 BC (SocA51310)	LSA	Mauran *et al*. 2020
Likoaeng, Lesotho	1	AD 766–887 (GrA-23237), AD 768–880 (GrA-26831), AD 640–903 (Pta-7877)	ceramic final LSA	Mitchell *et al*. 2008, 2011
Likoaeng, Lesotho	1	AD 203–255 (Pta-7865), AD 117–340 (Pta-7092), AD 200–250 (Pta-7097), 111 BC–AD 217 (Pta-9048), 141 BC–AD 136 (Pta-7876), 43 BC–AD 73 (Pta-7098), 590–349 BC (Pta-7101), 99–474 BC (GrA-23236), 7919–718 BC (Pta-7093), 1048–812 BC (GrA-23233), 1127–898 BC (GrA-26178), 1445–1196 BC (GrA-23535)	final LSA	Mitchell 2009; Plug *et al*. 2010; Mitchell *et al*. 2011

Continued on p. 192

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Limerock, South Africa (Northern Cape)	1	AD 28–252, AD 199–390	LSA (similar to final LSA)	Beaumont & Morris 1990; Wilkins 2021
Lincoln Cave, South Africa (Gauteng)	5	115.3 ± 7.7 ka	MSA	Reynolds *et al*. 2007
Lincoln Cave, South Africa (Gauteng)	8	252.6 ± 35.6 ka	early MSA	Reynolds *et al*. 2007
Lion Cavern, Eswatini	3	31 152–29 627 BC (GrN-5020)	final MSA	Vogel 1970
Lion Cavern, Eswatini	3	43.2 + 1.35/–1.2 ka	late MSA/Pietersburg?	Vogel 1970; Dart & Beaumont 1971
Liphofung, Lesotho	1	1003–753 BC (Pta-6106), 3193–2875 BC (Pta-6109), 6381–5789 BC (Pta-6113)	post-Classic Wilton (similar to final LSA)	Kaplan & Mitchell 2012
Lithakong, Lesotho	1	AD 1398–1489 (Pta-7077), AD 1150–1273 (Pta-7072)	post-Classic Wilton (consistent with ceramic final LSA)	Kaplan & Mitchell 2012
Lithakong, Lesotho	1	3641–3493 BC (Pta-7075)	post-Classic Wilton (similar to final LSA)	Kaplan & Mitchell 2012
Litsoetse, Lesotho	1	AD 1032–1156 (UGAMS-11593), AD 336–476 (OxA-x-2479)	LSA (similar to ceramic final LSA)	Arthur *et al*. 2018
Little Witkrans, South Africa (Northern Cape)	1	AD 21–258, 3638–3329 BC	LSA (similar to final LSA) Wilkins 2021	Beaumont & Morris 1990;
Little Witkrans, South Africa (Northern Cape)	1	6461–6215 BC	Similar to Wilton	Beaumont & Morris 1990; Wilkins 2021
Lovedale, South Africa (Free State)	4	77 ± 7 ka, 69 ± 7 ka, 56 ± 6 ka	Still Bay	Wroth *et al*. 2022
Lusu, Zimbabwe	1	541 BC–AD 579	pre-ceramic Wilton (similar to final LSA)	Clark & Fagan 1965
Mafusing 1, South Africa (Eastern Cape)	1	AD 246–386 (Beta-327310), AD 123–255 (Beta-327311), 590–400 BC (Beta-346496), 1695–1533 BC (Beta-346499)	final LSA	Pinto *et al*. 2018
Mafusing 1, South Africa (Eastern Cape)	1	3805–3649 BC (Beta-346500), 6012–5801 BC (Beta-346498)	Wilton	Pinto *et al*. 2018
Maloney's Kloof Rock Shelter, South Africa (Northern Cape)	1	11 350–10 666 BC	LSA	Doran *et al*. 2015
Maqonqo Shelter, South Africa (KwaZulu-Natal)	1	2031–1689 BC (Pta-6244), 2670–2469 BC (Pta-6245), 2871–2557 BC (Pta-6256), 925–2864 BC (Pta-5900), 3533–3122 BC (Pta-6251), 3643–3490 BC (Pta-5898), 3823–3624 BC (Pta-6255), 4620–4347 BC (Pta-6253), 5381–5001 BC (Pta-6258), 6515–6014 BC (Pta-6260), 8214–7468 BC (Pta-6259)	Wilton	Mazel 1996
Matjes River, South Africa (Western Cape)	1	3379–3319 BC (Pta-6877), 3539–3369 BC (Pta-6856), 4253–3968 BC (UCLA-1746-C-1), 4333–4039 BC (Pta-6976), 4341–4041 BC (Pta-6975), 4691–4361 BC (Pta-6917), 5666–5526 BC (Pta-6811), 6016–5716 BC (Pta-6691), 6008–5837 BC (Pta-6817), 6225–6054 BC (OxA-V-2064-52), 6412–6076 BC (Pta-6988)	Wilton	Döckel 1998; Sealy *et al*. 2006
Matjes River, South Africa (Western Cape)	1	6269–6081 BC (Pta-6823), 6588–6432 BC (Pta-6831), 7051–6564 BC (Pta-6688), 549–6083 BC (Pta-6687), 9331–8426 BC (Pta-6686), 9244–9115 BC (OxA-V-2064-56), 9384–8811 BC (Pta-6937), 9478–9201 BC (Pta-6936), 9690–9352 BC (Pta-6925),	Oakhurst, *H. sapiens*	Protsch & Oberholzer 1975; Morris 1992; Döckel 1998; Sealy *et al*. 2006

Continued on p. 193

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
		9838–9661 BC (Pta-6838), 9979–9811 BC (Pta-6951), 10 385–9231 BC (UCLA-1746-C-2), 10 524–9269 BC (Pta-6848), 12 126–10 473 BC (L-336H)		
Mauermanshoek, South Africa (Free State)	1	AD 1654–1895 (Pta-5929)	ceramic final LSA	Wadley 2001
Mauermanshoek, South Africa (Free State)	1	AD 340–429 (Pta-6301), 1982–1672 BC (Pta-5930)	final LSA	Wadley 2001
Mbabane Shelter, South Africa (KwaZulu-Natal)	1	AD 1410–1509 (Pta-3848), AD 1394–1508 (Pta-3684), AD 468–657 (Pta-3678)	ceramic final LSA	Mazel 1986a
Maidenhead 1, South Africa (Northern Cape)	1	AD 1654–1895	LSA (similar to ceramic final LSA)	Beaumont & Vogel 1989
Melikane, Lesotho	3	22 611–21 777 BC (OxA-23028)	early LSA	Stewart *et al*. 2012
Melikane, Lesotho	3	40 982–39 361 BC (OxA-22794), 40 410–34 358 BC (OxA-22793), 39 513–37 808 BC (OxA-22964), 38 728–35 362 BC (OxA-23031), 38 943–35 242 BC (OxA-23029), 38 647–35 112 BC (OxA-22792), 8 271–35 856 BC (OxA-22839), 341.3 ± 3 ka, 45.9 ± 3.8 ka	final MSA	Stewart *et al*. 2012; Jacobs & Roberts 2017
Melikane, Lesotho	3	49.2 ± 2.5 ka, 50 ± 1.9 ka, 53.8 ± 3.2 ka	post-Howiesons Poort	Stewart *et al*. 2012; Jacobs & Roberts 2017
Melikane, Lesotho	4	59.5 ± 3.3 ka, 61 ± 2.5 ka	Howiesons Poort	Stewart *et al*. 2012; Jacobs & Roberts 2017
Melikane, Lesotho	5	78.2 ± 4 ka, 79.5 ± 3.1 ka, 83.2 ± 6.3 ka	Afromontane MSA (pre-Still Bay Afromontane variant?)	Stewart *et al*. 2012; Jacobs & Roberts 2017; Pazan *et al*. 2022
Melkboom 1, South Africa (Northern Cape)	1	AD 1441–1663 (Pta-9514), AD 1391–1483 (Pta-4496)	ceramic final LSA	Beaumont *et al*. 1995; Parsons 2008
Melkbosstrand, South Africa (Western Cape)	1	AD 1054 (Pta-8797), AD 744 (Pta-7792), AD 715 (Pta-7800)	ceramic final LSA	Sealy *et al*. 2004
Melkhoutboom Cave, South Africa (Eastern Cape)	1	1231–810 BC (Pta-706)	final LSA	Deacon 1976
Melkhoutboom Cave, South Africa (Eastern Cape)	1	4951–4496 BC (Pta-680), 5985–5715 BC (Pta-668), 6266–5984 BC (UW-234)	Wilton	Deacon 1976
Melkhoutboom Cave, South Africa (Eastern Cape)	1	6645–6360 BC (Pta-666), 10 814–9763 BC (GaK-1538)	Oakhurst	Deacon 1976
Melkhoutboom Cave, South Africa (Eastern Cape)	2	16 931–16 622 BC (UW-223)	Robberg	Deacon 1976
Malkoppan, South Africa (Western Cape)	1	671–397 BC (Pta-6219), 2908–2617 BC (Pta-6220)	LSA (similar to final LSA)	Jerardino & Navarro 2018b
Mertenhof, South Africa (Western Cape)	2	16 708–16 313 BC (DAMS-003801), 17 579–17 234 BC (DAMS-003802)	Robberg	Low & Mackay 2018
Mgede Shelter, South Africa (KwaZulu-Natal)	1	>AD 1801 (Pta-3669), AD 1158–1300 (Pta-3665)	ceramic final LSA	Mazel 1986b
Mgede Shelter, South Africa (KwaZulu-Natal)	1	3193–2875 BC (Pta-3505), 5567–5330 BC (Pta-3508)	Wilton	Mazel 1986b
Mohapa Site 1, Botswana	1	1543–1256 BC, 65 BC–AD 139, AD 1379–1446, AD 1451–1636	LSA (similar to ceramic final LSA)	Yellen & Brooks 1989
Moshebi's Shelter, Lesotho	1	AD 1105–1217 (UGAMS-11591), 206–106 BC (UGAMS-11589), 3012–2872 BC (UGAMS-11590)	post-Classic Wilton (similar to final LSA)	Badenhorst *et al*. 2019
Muela, Lesotho	1	AD 1810–present (Pta-6335), AD 1461–1648 (PtA-6332),	post Classic Wilton (consistent with ceramic final LSA)	Kaplan & Mitchell 2012

Continued on p. 194

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
		AD 1625–1894 (Pta-6328), AD 1265–1395 (Pta-6329)		
Mwulu's Cave, South Africa (Limpopo)	5	~90 ka	MSA (Pietersburg?)	De la Peña *et al*. 2019; Feathers *et al*. 2020
Mzinyashana Shelter, South Africa (KwaZulu-Natal)	1	AD 1281–1424 (Pta-6715), AD 1206–1319 (Pta-6541), AD 1024–1212 (Pta-6538), AD 572–640 (Pta-6543)	ceramic final LSA	Mazel 1997
Mzinyashana Shelter, South Africa (KwaZulu-Natal)	1	2671–2285 BC (Pta-6540), 3028–2337 BC (Pt-6535)	Wilton	Mazel 1997
Mzinyashana Shelter, South Africa (KwaZulu-Natal)	1	393–151 BC (Pta-6542), 904–517 BC (Pta-6700), 1126–812 BC (Pta-6708), 1209–985 BC (Pta-6539)	final LSA	Mazel 1997
Nauga, South Africa (Northern Cape) Wilkins 2021	1	AD 316–529	LSA (similar to final LSA)	Beaumont & Morris 1990;
Nelson Bay Cave, South Africa (Western Cape)	1	AD 1433–1506 (Pta-1361), AD 1290–1416 (Pta-3362), AD 1150–1292 (Pta-3361), AD 542–651 (Pta-1360)	ceramic final LSA	Inskeep 1987
Nelson Bay Cave, South Africa (Western Cape)	1	AD 15–250 (GrN-5703), 150 BC–AD 29 (Pta-1363), 766–391 BC (Pta-2921), 791–460 BC (GrN-5715), 1212–970 BC (GrN-5702), 1316–902 BC (Pta-1485), 1302–971 BC (Pta-2913), 1308–1053 BC (Pta-2920), 1536–1258 BC (Pta-3095), 1688–1381 BC (Pta-3097)	final LSA	Inskeep 1987
Nelson Bay Cave, South Africa (Western Cape)	1	3715–3496 BC (UW-217), 4555–3640 BC (Pta-2933), 5008–4342 BC (UW-187), 4908–4440 BC (UW-216), 4846–4494 BC (Pta-2915), 905–4536 BC (Pta-2909), 45224–4501 BC (UW-176), 5225–4670 BC (UW-222)	Wilton	Deacon 1982, 1984; Inskeep 1987
Nelson Bay Cave, South Africa (Western Cape)	1	7533–6462 BC (UW-181), 8015–7175 BC (UW-184), 297–7816 BC (Pta-391), 810 023–9322 BC (Pta-392), 10 112–9356 BC (UW-164), 10 551–9307 BC (Q-1085), 10 770–10 069 BC (UW-178), 11 551–10 632 BC (I-6515), 11 565–11 121 BC (UW-162), 12 168–11 515 BC (UW-177)	Oakhurst	Deacon 1982, 1984
Nelson Bay Cave, South Africa (Western Cape)	2	18 780–17 602 BC (I-6516), 21 181–18 575 BC (UW-175), 20 947–20 403 BC (GrN-5884)	Robberg	Deacon 1982, 1984
New Belgium, South Africa (Limpopo)	1	AD 1643–1823 (Pta-5790), AD1482–1676 (Pta-5138)	final LSA	Van der Ryst 1998
Ngalue, Mozambique	3	40.6 ± 33 ka, 45.3 ± 3.7 ka, 5 50.3 ± 4.4 ka, 50.7 ± 4.4 ka, 5.1 ± 5.8 ka, 55.2 ± 14.6 ka	late-final MSA	Mercader *et al*. 2009
Ngalue, Mozambique	5	105.3 ± 13.6 ka	MSA	Mercader *et al*. 2009
Niassa, Mozambique	2	29 +3/-11 ka	final MSA	Mercader *et al*. 2012
Nkupe Shelter, South Africa (KwaZulu-Natal)	1	765–404 BC (Pta-3443), 1536–1258 BC (Pta-3269)	final LSA	Mazel 1988
Nkupe Shelter, South Africa (KwaZulu-Natal)	1	2580–2196 BC (Pta-3275), 3516–3022 BC (Pta-3276), 4725–4440 BC (Pta-3460), 5672–5468 BC (Pta-3455)	Wilton	Mazel 1988

Continued on p. 195

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Nooitgedacht 1, South Africa (Northern Cape)	1	AD 1015–1185	LSA (similar to ceramic final LSA)	Beaumont & Vogel 1989
Ntloana T oana, Lesotho	1	7875–7606 BC (Pta-5238), 8928–8307 BC (Pta-5237), 9306–8706 BC (Pta-5207), 10 151–9331 BC (Pta-5208), 12 373–11 656 BC (Pta-5236)	Oakhurst	Mitchell 1993a; Mitchell & Arthur 2010
Ntloana T oana, Lesotho	3	55.5 ± 3 ka, 56 ± 1.8 ka	post-Howiesons Poort	Mitchell & Steinberg 1992; Jacobs, Roberts *et al*. 2008; Jacobs & Roberts 2017
Ntloana T oana, Lesotho	4	59.8 ± 3.2 ka, 60.9 ± 2.8 ka	Howiesons Poort	Mitchell & Steinberg 1992; Jacobs, Roberts *et al*. 2008; Jacobs & Roberts 2017
Oakhurst, South Africa (Western Cape)	1	1899–1533 BC (Pta-520), 7043–6587 BC (Pta-377)	Wilton	Schrire 1962
Oakhurst, South Africa (Western Cape)	1	9286–7750 BC (Pta-410)	Oakhurst	Schrire 1962
Olieboomspoort, South Africa (Limpopo)	5–6	77–78 ka, 149 ± 15 ka, 150 ± 14 ka	MSA (Pietersburg?)	Mason 1962; Val *et al*. 2021
Omungunda 99, Namibia	1	AD 1097–1284 (KN-5288)	late Ceramic LSA (consistent with c eramic final LSA)	Vogelsang & Eichhorn 2011
Omungunda 99, Namibia	1	AD 419–581 (KN-5285), 319–196 BC (KN-5675), 811–727 BC (KN-5674)	microlithic LSA (similar to final LSA)	Vogelsang & Eichhorn 2011
Omungunda 99, Namibia	1	7066–6771 BC (KIA-11984)	Oakhurst	Vogelsang & Eichhorn 2011
Omungunda 99, Namibia	2	12 227–12 016 BC (KIA-11983), 12 602–12 118 BC (UtC-9879)	Robberg	Vogelsang & Eichhorn 2011
Orange Springs, South Africa (Free State)	1	1086–796 BC (Wits-2002)	final LSA	Thorp 1996
Oruwanje 95, Namibia	1	AD 1405–1453 (KN-4849), AD 870–1049 (KN-5299), AD 245–435 (KN-4850), AD 65–247 (KN-5302), 234–92 BC (KN-5005)	early Ceramic Phase (consistent with ceramic final LSA)	Vogelsang & Eichhorn 2011
Ovizorombuku 96, Namibia	1	AD 1447–1516 (KN-5372), AD 1098–1217 (KN-5260), 198–51 BC (KN-5371)	microlithic LSA (consistent with ceramic final LSA)	Vogelsang & Eichhorn 2011
Ovizorombuku 96, Namibia	1	1207–922 BC (KN-5326)	LSA (similar to Wilton)	Vogelsang & Eichhorn 2011
Ovizorombuku 96, Namibia	1	8289–8160 BC (Utc-8104), 7591–7174 BC (KN-5310)	Oakhurst	Vogelsang & Eichhorn 2011
Ovizorombuku 98, Namibia	1	AD 520–643 (KN-5465), 1463–1369 BC (KIA-27702)	microlithic LSA (similar to final LSA)	Vogelsang & Eichhorn 2011
Ovizorombuku 98, Namibia	1	6068–5970 BC (KIA-17711)	Oakhurst	Vogelsang & Eichhorn 2011
Ovizorombuku 98, Namibia	2	12 794–12 381 BC (KIA-17712)	Robberg	Vogelsang & Eichhorn 2011
Penhill Farm (Sundays River), South Africa (Eastern Cape)	44	<1.37 ± 0.16 Ma	Acheulean	Lotter & Kuman 2018b; Lotter 2020
Pinnacle Point Cave 13B, South Africa (Western Cape)	5	90.5 ± 4.9 ka, 91.3 ± 5.0 ka, 92.2 ± 5.0 ka, 92.7 ± 4.9 ka, 93.4 ± 5.6 ka, 93.8 ± 5.3 ka, 96.3 ± 5.6 ka, 98.4 ± 5.0 ka, 98.4 ± 5.8 ka, 98.8 ± 5.4 ka, 110.1 ± 5.3 ka, 110.2 ± 5.2 ka, 112.8 ± 5.1 ka, 122.3 ± 6.2 ka, 122.4 ± 8.1 ka, 124.7 ± 6.1 ka, 125.4 ± 6.9 ka, 126.8 ± 7.6 ka, 127.8 ± 4.7 ka	MSA/MIS 5	Jacobs 2010
Pinnacle Point Cave 13B, South Africa (Western Cape)	6	156.8 ± 10.2 ka, 159.1 ± 8.4 ka, 159.9 ± 8.0 ka, 162.0 ± 9.4 ka, 166.1 ± 8.5 ka	MSA/MIS 6	Jacobs 2010
Pinnacle Point Cave 5-6, South Africa (Western Cape)	3–4	51 ± 2 ka, 52 ± 3 ka, 61 ± 4 ka, 62 ± 3 ka,	MSA with backed pieces (Howiesons Poort?)	Brown *et al*. 2012; Karkanas et al. 2015;

Continued on p. 196

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
		63 ± 3 ka, 64 ± 3 ka, 69 ± 3 ka, 70.6 ± 2.3 ka, 71 ± 3 ka		Wilkins *et al*. 2017; Smith *et al*. 2018
Pinnacle Point Cave 5-6, South Africa (Western Cape)	5	72 ± 3 ka	MSA/ALBS (small sample quartzite, Mount Toba isochron)	Karkanas *et al*. 2015
Pinnacle Point Cave 5-6, South Africa (Western Cape)	5	81 ± 4 ka, 96 ± 6 ka	MSA/MIS 5	Karkanas *et al*. 2015
Pinnacle Point Shell Midden, South Africa (Western Cape)	1	325–191 BC (Beta-380658), 1405–981 BC (Beta-390661)	Holocene LSA (similar to final LSA)	McGrath *et al*. 2015
Pniel 6, South Africa (Northern Cape)	6	>120 ka, likely 130-190 ka	early MSA	Beaumont 1999; Lisiecki & Raymo 2005; Hutson 2018
Pockenbank, Namibia	2	21 950–20 551 BC (KN-I623), 22 214–21 142 BC (Pta-1203)	early LSA	Ossendorf 2013; Vogel & Visser 1981
Pockenbank, Namibia	3	34 405–32 666 BC (Pta-544), 39 908–37 565 BC (Pta-503)	early LSA/MSA	Ossendorf 2013; Vogel & Visser 1981
Pockenbank, Namibia	3	34 423–32 676 BC (Pta-544), 39 908–37 565 BC (Pta-503), >46 055 BC (Pta-504)	MSA	Vogel & Visser 1981
Port Nolloth Midden PN2009/001, South Africa (Northern Cape)	1	846–770 BC (UGAMS-6607)	Holocene microlithic (similar to final LSA)	Webley & Orton 2013
Posberg Reserve, Drie Susters (Main), South Africa (Western Cape)	1	AD 957–1181 (Pta-5478)	ceramic final LSA	Smith *et al*. 1991
Praia de Chizavane, Mozambique	1	AD 1641–1673 (Wk-45800), AD 1389–1412(Wk-45799), AD 1215–1706 (St-8589), AD 1020–1316 (St-8590)	LSA (similar to ceramic final LSA)	Robb *et al*. 2021
Putslaagte 8, South Africa (Western Cape)	2	15 800–18 200 BP (PL8-8)	Robberg	Low & Mackay 2016
Putslaagte 8, South Africa (Western Cape)	2	21 060–19 827 BC (AA99784), 25 700–29 500 BP (PL8-5)	LSA (consistent with early LSA)	Low & Mackay 2016
Putslaagte 8, South Africa (Western Cape)	3	33.2 ka- 44.5 ka	late MSA	Mackay *et al*. 2015
Putslaagte 8, South Africa (Western Cape)	4	65.1 ± 5.5 ka, 66.0 ± 4.9 ka	Howiesons Poort (also bifacial points, SB?)	Mackay *et al*. 2015
Putslaagte 8, South Africa (Western Cape)	5	75.5 ± 6.0	pre-Howiesons Poort (Still Bay?)	Mackay *et al*. 2015
Ravenscraig, South Africa (KwaZulu-Natal)	1	10 151–9331 BC (Pta-3450)	Oakhurst	Opperman 1987
Reception Shelter, South Africa (Western Cape)	1	AD 1286–140 (AA89907), AD 1187–1293 (AA899909)	ceramic final LSA	Orton *et al*. 2011
Reception Shelter, South Africa (Western Cape)	1	802–473 BC (AA89910)	final LSA	Orton *et al*. 2011
Reception Shelter, South Africa (Western Cape)	2	24 429–23 951 BC (AA89908)	early LSA	Orton *et al*. 2011
Red Balloon, South Africa (Limpopo)	5	91 ± 6 ka, 96 ± 5 ka, 104 ± 9 ka	MSA (unifacial, bifacial and Levallois points, Pietersburg?)	Wadley *et al*. 2021
Rhino Cave, Botswana	1	AD 986–1270, AD 249–598	LSA (similar to final LSA)	Robbins, Brook *et al*. 2000
Rietputs 15 Pit 5, South Africa (Northern Cape)	39–41	1.27 ± 0.20 Ma, 1.31 ± 0.21 Ma	early Acheulean	Leader *et al*. 2018
Rising Star, South Africa (Gauteng)	8	231 ± 41 ka, 232 ± 8 ka, 244 ± 3 ka, 247 ± 37 ka, 96 ± 14 ka, 353 ± 61 ka, 2478 + 107/-41 ka, 502 + 181/-53 ka	*H. naledi*	Berger *et al*. 2015; Dirks *et al*. 2017; Robbins *et al*. 2021
Rooidam 1, South Africa (Northern Cape)	5	108 ± 9 ka	MSA	Szabo & Butzer 1979; Eltzholtz 2020
Rooidam 1, South Africa (Northern Cape)	6	174 ± 20 ka	early MSA	Szabo & Butzer 1979; Eltzholtz 2020
Rooikrans, South Africa (Free State)	1	5231–4793 BC (Wits-2003)	Wilton	Thorp 1996

Continued on p. 197

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Rooikrans, South Africa (Free State)	1	>AD 1806 (Pta-5761), >AD 1798 (Pta-5762), AD 1435–1645 (AxA-3386)	ceramic final LSA	Thorp 1996
Roosfontein, South Africa (Free State)	1	AD 670–892 (Pta-5931)	ceramic final LSA	Klatzow 2000
Roosfontein, South Africa (Free State)	1	AD 670–892 (Pta-5931), AD 17–252 (Pta-5932)	final LSA	Klatzow 2000
Rose Cottage Cave, South Africa (Free State)	1	AD 1394–1508 (Pta-6788), AD 1281–1405 (Pta-5622)	ceramic final LSA	Wadley & Vogel 1991; Wadley 1992; Thorp 1996
Rose Cottage Cave, South Africa (Free State)	2–3	27.6 ± 2.3 ka, 29.8 ± 1.6 ka, 31.7 ± 1.8 ka, 34.8 ± 22 ka	final MSA	Pienaar *et al*. 2008
Rose Cottage Cave, South Africa (Free State)	1	394–104 BC (Pta-7117)	final LSA	Wadley & Vogel 1991; Wadley 1992; Thorp 1996
Rose Cottage Cave, South Africa (Free State)	1	5003–4652 BC (Pta-5934), 6599–6330 BC (Pta-6783)	Wilton	Wadley 2000a,b
Rose Cottage Cave, South Africa (Free State)	1	8.6 ± 0.6 ka, 7351–6901 BC (Pta-7122), 7545–7180 BC (Pta-5600), 7682–7530 BC (Pta-5560), 8617–8290 BC (Pta-5599)	Oakhurst	Wadley 1997, 2000a; Pienaar *et al*. 2008
Rose Cottage Cave, South Africa (Free State)	2	13.0 ± 1.2 ka, 13 530-12 834 BC (Pta-5593), 13.6 ± 1.4 ka, 14 544-13 651 BC (Pta-5601)	Robberg	Wadley 1996b; Pienaar *et al*. 2008
Rose Cottage Cave, South Africa (Free State)	2	23 415–22 139 BC (Pta-5598), 25 371–24 431 BC (Pta-1417), 25 871–25 317 BC (Pta-1416), 28 298–27 303 BC (GrN-5300), 31 120–28 768 BC (Pta-211)	early LSA	Wadley & Vogel 1991; Wadley 1993; Clark 1999
Rose Cottage Cave, South Africa (Free State)	3–4	47.1 ± 10.2 ka, 49.4 ± 10.1 ka, 50.5 ± 4.6 ka, 56 ± 2.6 ka, 9.4 ± 4.5 ka, 61.8 ± 2.8 ka	post-Howiesons Poort	Valladas *et al*. 2005; Jacobs, Roberts *et al*. 2008; Pienaar *et al*. 2008
Rose Cottage Cave, South Africa (Free State)	3–4	41.7 ± 3.7 ka, 48.9 ± 5.3 ka, 54 ± 4.4 ka, 56.3 ± 4.5 ka, 58.6 ± 6.6 ka, 60.4 ± 4.6 ka, 62.5 ± 2.9 ka, 63 ± 2.3 ka, 63.2 ± 2.3 ka, 64.2 ± 3 ka, 64.6 ± 3 ka, 65 ± 3.5 ka, 68.7 ± 2.7 ka	Howiesons Poort	Valladas *et al*. 2005; Jacobs, Roberts *et al*. 2008; Pienaar *et al*. 2008; Jacobs & Roberts 2017
Rose Cottage Cave, South Africa (Free State)	4–5	64.5 ± 6.6 ka, 68.4 ± 8.3 ka, 71.4 ± 4.2 ka, 72.5 ± 6.8 ka, 76.3 ± 14.8 ka, 95.9 ± 6.6 ka	pre-Howiesons Poort	Valladas *et al*. 2005; Pienaar *et al*. 2008
Schurfpoort 112 KR, South Africa (Limpopo)	1	AD 1282–1395 (Pta-5127), AD 1151–1296 (Pta-5133), AD 1148–1288 (Pta-5132)	final LSA	Van der Ryst 1998
Scott's Cave, South Africa (Eastern Cape)	1	AD 1437–1680 (Yale University Laboratory), AD 669–1047 (Gulbenkian Laboratory, Salisbury)	ceramic final LSA	Deacon & Deacon 1963; Deacon 1967
Sehonghong, Lesotho	1	AD 770–907 (Pta-8064), AD 596–774 (Pta-885), AD 338–423 (Pta-6063)	ceramic final LSA	Mitchell 1996a, 2010; Vinnicombe 2009
Sehonghong, Lesotho	1	4993–4607 BC (Pta-6154), 5845–5624 BC (Q-3174)	Wilton	Mitchell 1996b
Sehonghong, Lesotho	1	5994–5722 BC (Pta-6083), 6065–5751 BC (Pta-6280), 6229–5889 BC (Pta-6072), 6262–5982 BC (Pta-6278), 8570–8304 BC (Pta-6368), 9406-8699 BC (Pta-6057)	Oakhurst	Mitchell 1996b
Sehonghong, Lesotho	2	12 520–11 821 BC (Pta-6282),	Robberg	Mitchell 1995

Continued on p. 198

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
		12 686–12 216 BC (Pta-6062), 13 128–11 636 BC (Q–3176), 13 316–11 624 BC (Q-3165), 13 984–12 250 BC (Q-3173), 13 984–13 171 BC (Pta-884), 14 291–13 383 BC (Q-3172), 17 391–16 741 BC (Pta-6060), 20 303–18 940 BC (Q-1452), 21 832–21 023 BC (Pta-6281)		
Sehonghong, Lesotho	2	23 269–22 062 BC (Pta-6059), 28 032–26 827 BC (Pta-6271), 29 095–27 498 BC (Pta-6268)	early LSA	Mitchell 1994; Plug & Mitchell 2008
Sehonghong, Lesotho	3	29 205–30 190 BP, 30.3 ± 3.4 ka, 31.2 ± 1.5 ka, 31.6 ± 1.2 ka	final MSA	Mitchell 1994; Jacobs, Roberts *et al*. 2008; Jacobs & Roberts 2017; Pargeter *et al*. 2017
Sehonghong, Lesotho	3	45.9 ± 2.7 ka, 46.5 ± 2.5 ka, 49 ± 2.4 ka, 57.6 ± 2.3 ka	post-Howiesons Poort	Jacobs, Roberts *et al*. 2008; Jacobs & Roberts 2017
Sehonghong, Lesotho	4	62.2 ± 1.7 ka, 63.9 ± 3.7 ka	Howiesons Poort	Barré & Lamothe 2010
Sesfontein N2005/1, Namibia	1	905–803 BC (KIA-29630), 2505–2293 BC (KN-5797)	Wilton-like microlithic (similar to final LSA)	Ossendorf 2017b
Sesfontein N2005/1, Namibia	1	4448–4326 BC (KIA-29629)	Wilton	Ossendorf 2017b
Sesfontein N2005/2, Namibia	1	148 BC–AD 25 (KN-5798)	Wilton-like microlithic (similar to final LSA)	Ossendorf 2017b
Sesfontein N2005/2, Namibia	1	8216–7810 BC (KIA-29631)	Oakhurst	Ossendorf 2017b
Shongweni, South Africa (KwaZulu-Natal)	2	25 816–24 869 BC (Pta-966)	early LSA	Davies 1975; Vogel *et al*. 1986; Wadley 1993
Sibebe Rock Shelter, eSwatini	1	16–225 AD (Pta-3347)	Ceramic final LSA	Bader *et al*. 2022
Sibebe Rock Shelter, eSwatini	1	1744–1538 BC (Beta-594921), 117–251 AD (Beta-594923), 522–642 AD (Beta-594922)	final LSA	Bader *et al*. 2022
Sibebe Rock Shelter, eSwatini	2	42350–40849 BC (Beta-541993), 35881–32354 BC (Pta-3349), 25451–24921 BC (GrN-5314)	final MSA	Vogel 1970; Price-Williams 1981; Bader *et al*. 2022
Sibudu Cave, South Africa (KwaZulu-Natal)	3	37.6 ± 2.4 ka, 38 ± 2.6 ka	final MSA	Jacobs, Roberts *et al*. 2008; Jacobs, Wintle *et al*. 2008
Sibudu Cave, South Africa (KwaZulu-Natal)	3	49.4 ± 2.3 ka, 46 ± 1.9 ka, 46.6 ± 2.3 ka, 47.6 ± 1.9 ka, 48 ± 2.4 ka, 49.1 ± 2.1 ka	late MSA	Jacobs, Roberts *et al*. 2008; Jacobs, Wintle *et al*. 2008
Sibudu Cave, South Africa (KwaZulu-Natal)	3–4	56.7 ± 2.1 ka, 57.6 ± 2.1 ka, 58.2 ± 2.4 ka, 58.3 ± 2 ka, 58.6 ± 2.1, 59.6 ± 2.3 ka	post-Howiesons Poort (Sibudu)	Jacobs, Roberts *et al*. 2008; Jacobs, Wintle *et al*. 2008
Sibudu Cave, South Africa (KwaZulu-Natal)	4	61.7 ± 2 ka, 63.8 ± 2.8 ka, 64.7 ± 2.3 ka	Howiesons Poort, *H. sapiens*	Jacobs, Roberts *et al*. 2008; Jacobs, Wintle *et al*. 2008; Riga *et al*. 2018; Will *et al*. 2019
Sibudu Cave, South Africa (KwaZulu-Natal)	4	70.5 ± 2 ka	Still Bay	Jacobs, Roberts *et al*. 2008; Lombard *et al*. 2019
Sibudu Cave, South Africa (KwaZulu-Natal)	5	72.5 ± 2 ka, 73.2 ± 2.3 ka, 77.3 ± 2.2 ka	pre-Still Bay (consistent with Still Bay), *H. sapiens*	Jacobs, Roberts *et al*. 2008; Riga *et al*. 2018; Lombard *et al*. 2019; Will *et al*. 2019
Simon se Klip at Steenbokfontein, South Africa (Western Cape)	1	AD 704 (GX32343), AD 851 (GX32342), AD 972 (GX32341)	ceramic final LSA	Jerardino & Maggs 2007
Siphiso Shelter, eSwatini	1	AD 1452–1671 (Tx-5622), AD 810–775 (Tx-5619), AD 900–880 (Tx-5620)	ceramic final LSA	Barham 1989

Continued on p. 199

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Siphiso Shelter, eSwatini	1	5217–3958 BC (Tx-5621), 5929–5302 BC (Tx-5624), 5721–5470 BC (Tx-5625), 5887–5305 BC (Tx-5623), 5921–5535 BC (Tx-5626), 6378–5943 BC (Tx-5627)	Wilton	Barham 1989
Siphiso Shelter, eSwatini	1	6572–6240 BC (Pta-3533), 8017–7523 BC (Pta-3540), 8209–7246 BC (Tx-5630), 8826–8301 BC (Tx-5628), 9151–8275 BC (Y-1996), 9231–8228 BC (Tx-5629), 10 252–7744 BC (Pta-004)	Oakhurst	Barham 1989
Siphiso Shelter, eSwatini	2	10 151–9196 BC (Tx-5782), 12 630–11 148 BC (Tx-5631), 12 934–11 364 BC (Tx-5783)	Robberg	Barham 1989
Siphiso Shelter, eSwatini	2	15 195–13 173 BC (Tx4784), 14 800 ± 800 (ESR)	LSA (similar to early LSA)	Barham 1989
Siphiso Shelter, eSwatini	2	15 195–13173 BC (Tx4784), 14 800 ± 800 (ESR)	final MSA	Barham 1989
Soutpanskliphuewel, South Africa (Western Cape)	1	AD 1105–1217 (UGAMS-10296), AD 889–994 (UGAMS-8560), AD 884–994 (UGAMS-8865), 2940–2863 BC (UGAMS-8567)	LSA (similar to final LSA)	Jerardino *et al*. 2018
Spitzkloof A, South Africa (Northern Cape)	3–4	>50 507 BC (UBA-17618), 52 007–48 728 BC (UBA-17617), >59 250 bp (UBA-17616)	MSA	Dewar & Stewart 2016
Spoeg River Cave, South Africa (Northern 1 Cape)		AD 766-900 (GrA-9027), AD 598–775 (Pta-4753), AD 542–688 (Pta-6750), AD 57–241 (Pta-4745), AD 21–245 (Pta-6749), 179 BC–AD 75 (OxA-3862)	ceramic final LSA	Webley 1992, 2002; Sealy & Yates 1994
Spoeg River Cave, South Africa (Northern 1 Cape)		AD 57–255 (GrA-9029), AD 28–252 (GrA-9028), 546–371 BC (Pta-7200, 1951–1667 BC (Pta-6754), 2038–1736 BC (Pta-6987)	final LSA	Webley 2002
St Francis Bay, South Africa (Eastern Cape)	1	AD 203–420 (Pta-9311)	ceramic final LSA	Binneman 2004/2005
St Francis Bay 2/4, South Africa (Eastern Cape)	1	2885–2566 BC (Pta-7550)	final LSA	Binneman 2004/2005
Steenbokfontein, South Africa (Western Cape)	1	235–58 BC (Pta-6136), 541–346 BC (Pta-6136), 762–409 BC (Pta-6505), 983–749 BC (Pta-6134)	final LSA	Jerardino & Yates 1996
Steenbokfontein, South Africa (Western Cape)	1	1939–1665 BC (Pta-6794), 2142–1866 BC (Pta-6850), 2628–2277 BC (Pta6420), 6070 bp (Pta-6808)	Wilton	Jerardino & Yates 1996
Sterkfontein, South Africa (Gauteng)	8	252 ± 42 ka	early MSA	Ogola 2009
Sterkfontein (Member 5a), South Africa (Gauteng)	63–49	1.64 ± 0.15 Ma	*H. habilis*, *Homo* sp.	Curnoe & Tobias 2006; Curnoe 2010; Herries & Shaw 2011; Wood 2011; Pickering *et al*. 2019
Sterkfontein (Member 5 East), South Africa (Gauteng)	41–84	1.32 ± 0.08 Ma, 2.18 ± 0.21 Ma	Oldowan, *Homo* sp.	Curnoe & Tobias 2006; Curnoe 2010; Herries & Shaw 2011; Granger *et al*. 2015; Pickering *et al*. 2019
Sterkfontein (Member 5 West), South Africa (Gauteng)	34	1.13 ± 0.13 Ma	early Acheulean, *H. ergaster*	Kuman & Clarke 2000; Curnoe & Tobias 2006; Curnoe 2010;

Continued on p. 200

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
				Herries & Shaw 2011; Pickering *et al*. 2019
Strathalan B, South Africa (KwaZulu-Natal)	2	25 321–24 332 BC (Pta-4858), 25 998–24 962 BC (Pta-4869), 28 890–27 212 BC (Pta-4644), 29 819–28 192 BC (Pta-5040), 32 378–31 176 BC (Pta-5569)	final MSA	Opperman & Heydenrych 1990; Opperman 1996
Sunnyside 1, South Africa (Free State)	3	30.3 ± 1.4 ka	Similar to early LSA	Henderson *et al*. 2006
Sunnyside 1, South Africa (Free State)	3	30.3 ± 1.4 ka	final MSA	Henderson *et al*. 2006
Sunnyside 1, South Africa (Free State)	4	62.3 ± 2.3 ka	MSA (consistent with Howiesons Poort)	Henderson *et al*. 2006
Swartkrans (Member 4), South Africa (Gauteng)	5	<110.3 ± 1.9 ka	MSA	Sutton *et al*. 2009
Swartkrans (Member 1 Hanging remnant), South Africa (Gauteng)	84–65	2.249 ± 0.077 Ma, 1.706 ± 0.069 Ma, 1.63 ± 0.16 Ma (ESR)	*H. erectus*, *Homo* sp.	Grine 1989; Susman 1989; Curnoe *et al*. 2001; Susman *et al*. 2001; Wood 2011; Pickering *et al*. 2012
Swartkrans (Member 1 Lower Bank), Gauteng	63–87	1.80 ± 0.09 Ma, 1.83 ± 1.38 Ma, 2.19 ± 0.08 Ma, 2.22 ± 0.09 Ma, 2.25 ± 0.08 Ma	Oldowan, *Homo* sp.	Balter *et al*. 2008; Gibbon *et al*. 2014; Kuman *et al*. 2021; Pickering *et al*. 2011
Swartkrans (Member 2), Gauteng	43	1.36 ± 0.29 Ma	early Acheulean, *H. erectus*, *Homo* sp.	Grine 1989; Susman 1989; Susman *et al*. 2001; Balter *et al*. 2008; Wood 2011; Pickering *et al*. 2012
Swartkrans (Member 3), Gauteng	21–22	830 ± 210 ka, 960 ± 90 ka	Acheulean, *Homo* sp.	Grine 1989; Susman 1989; Balter *et al*. 2008; Gibbon *et al*. 2014
Tandjiesberg, South Africa (Free State)	1	AD 1104–1295 (Wits-2004)	ceramic final LSA	Thorp 1996, 1997; Wadley & McLaren 1998
The Havens Cave, South Africa (Eastern Cape)	1	5306–4897 BC (Pta-3917), 5665–5331 BC (Pta-3913)	Wilton	Binneman 1997
The Havens Cave, South Africa (Eastern Cape)	1	9384–8811 BC (Pta-4620)	Oakhurst	Binneman 1997
Tloutle, Lesotho	1	5231–4786 BC (Pta-5158), 5914–5629 BC (Pta-5162), 6233–5964 BC (Pta-5171)	Wilton	Mitchell 1993b
Toromoja, Botswana	1	1311–1011 BC	Consistent with Wilton	Helgren 1984
Toteng 1, Botswana	1	AD 422-578, AD 353–658, 177 BC–AD 26, 2.1 ± 0.7 ka, 3.5 ± 0.5 ka, 5 ± 0.8 ka	Similar to ceramic final LSA	Robbins *et al*. 2008
Toteng 3, Botswana	1	AD 415–591, AD 331–524	LSA (similar to ceramic final LSA)	Robbins *et al*. 2008
Toteng Quarry, Botswana	3–4	51.5 ± 7.2 ka, 51.9 ± 8.5 ka, 55.8 ± 10.5 ka, 58.2 ± 10.2 ka	MSA	Brook *et al*. 2008
Tshisiku Shelter, South Africa (Limpopo)	1	1296–928 BC (Pta-8654)	final LSA	Van Doornum 2007
Tshisiku Shelter, South Africa (Limpopo)	1	4355–4153 BC (Pta-8652), 5728–5522 BC (Pta-8709)	Wilton	Van Doornum 2007
Tuinplaas, South Africa (Limpopo)	2	20 ± 3 ka - 11 ± 0.7 ka	*H. sapiens* skeleton	Pike *et al*. 2004
Twyfelpoort, South Africa (Free State)	1	AD 60–259 (Pta-6171)	final LSA	Backwell *et al*. 1996
Uitspankraal 9, South Africa (Western Cape)	2	25 400–29 600 BP (UoW-2007)	Robberg	Watson *et al*. 2020
Umbeli Belli Rock Shelter, South Africa (KwaZulu-Natal)	2	29 ± 2 ka	final MSA	Bader *et al*. 2018

Continued on p. 201

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Umhlatuzana, South Africa (KwaZulu-Natal)	1	1325–916 BC, 1545–986 BC	Holocene LSA (consistent with Wilton)	Kaplan 1990; Lombard *et al*. 2010
Umhlatuzana, South Africa (KwaZulu-Natal)	1	14 495–13 676 BC (Pta-4226), 8626–8218 BC (Pta-4307)	late Robberg	Kaplan 1990; Lombard *et al*. 2010; Sifogeorgaki *et al*. 2020
Umhlatuzana, South Africa (KwaZulu-Natal)	3	37 183–33 667 BC (Pta-4389)	early LSA	Kaplan 1990; Lombard *et al*. 2010
Umhlatuzana, South Africa (KwaZulu-Natal)	3	37 183–33 667 BC (Pta-4389), 41 511–33 891 BC (Pta-4228), 43 044–40 344 BC (Pta-4331), 43 331–40 340 BC (Pta-4663)	final MSA	Kaplan 1990; Lombard *et al*. 2010; Sifogeorgaki *et al*. 2020; Reidsma *et al*. 2021
Umhlatuzana, South Africa (KwaZulu-Natal)	3	43 582–39 602 BC (Pta-4288), 46 038–39 084 BC (Pta-4235), 43 971–41 343 BC (Pta-4366), 41.9 ± 2.6 ka, 45 433–42 197 BC (Pta-4665), 48 466–42 648 BC (Pta-4333)	late MSA	Kaplan 1990; Lombard *et al*. 2010
Umhlatuzana, South Africa (KwaZulu-Natal)	4	60 ± 3.5 ka	Howiesons Poort	Kaplan 1990; Lombard *et al*. 2010
Umhlatuzana, South Africa (KwaZulu-Natal)	4	70.5 ± 4.7 ka	Still Bay	Kaplan 1990; Lombard *et al*. 2010; Högberg & Lombard 2016
Uniondale, South Africa (Eastern Cape)	1	199 BC–AD 58 (Pta-1804), 190–42 BC (weighted mean), 201 BC–AD 31 (Pta-1803)	ceramic final LSA	Leslie-Brooker 1987; Sadr & Sampson 2006
Varsche Rivier 003, South Africa (Western Cape)	3	40.4 ± 2.9 ka, 41.7 ± 2.9 ka, 42.3 ± 2.7 ka, 45.7 ± 2.8 ka	late MSA	Steele *et al*. 2016
Varsche Rivier 003, South Africa (Western Cape)	4	59.9 ± 3.4 ka, 61.4 ± 3.8 ka	Howiesons Poort	Steele *et al*. 2016
Varsche Rivier 003, South Africa (Western Cape)	5	74.5 ± 1.3 ka, 80.8 ± 4.6 ka	Still Bay	Steele *et al*. 2016
Varsche Rivier 003, South Africa (Western Cape)	5	88.3 ± 3.2 ka, 89.9 ± 5.0 ka, 90.7 ± 0.7 ka	Undefined MSA	Steele *et al*. 2016
Varsche River 048, South Africa (Western Cape)	1	AD 1391-1500 (IT-C-678)	Similar to ceramic final LSA	Orton 2018
Vleesbaai Area B, South Africa (Western Cape)	5	73.4 ± 5.2 ka, 73.9 ± 4.2 ka	MSA	Smith *et al*. 2018;
Vlermuisgat, South Africa (Northern Cape)	1	>AD 1797 (Pta-9504), AD 1430–1635 (Pta-9511), AD 1401–1511 (Pta-9510)	ceramic final LSA	Parsons 2008 Wilkins 2020
Voëlvlei, South Africa (Western Cape)	1	AD 1482–1631 (Pta-5547), AD 594–689 (Pta-5527)	ceramic final LSA	Smith *et al*. 1991
Voëlvlei, South Africa (Western Cape)	1	AD 22–248 (Pta-5551)	final LSA	Smith *et al*. 1991
Waterfall Bluff, South Africa (Eastern Cape)	2–3	27.8 ± 2.1 ka, 37.6 ± 4.2 ka	MSA	Fisher *et al*. 2020
White Paintings, Botswana	3–5	33.9 ± 0.3 ka, 45.2 ± 12.6 ka, 54.2 ± 9.5 ka, 55.4 ± 4.7 ka, 55.43 ± 4.7 ka, 58.5 ± 12.2 ka, 61.2 ± 12.4 ka, 66.4 ± 6.5 ka, 94.3 ± 9.4 ka	MSA	Feathers 1997; Robbins, Murphy *et al*. 2000; Ivester *et al*. 2010
Wilton Large Rock Shelter, South Africa (Eastern Cape)	1	545–46 BC (GaK-1540)	final LSA	Deacon 1972
Wilton Large Rock Shelter, South Africa (Eastern Cape)	1	3814–3362 BC (I-2565)	Wilton	Deacon 1972
Wilton Large Rock Shelter, South Africa (Eastern Cape)	1	7382–7065 BC (GaK-1541)	Oakhurst	Deacon 1972
Witklip, South Africa (Western Cape)	1	AD 1462–1669 (Pta-5467), AD 1394–1508 (Pta-5469), AD 632–775 (Pta-4608), AD 110–341 (Pta-4609)	ceramic final LSA	Smith *et al*. 1991
Witkrans, South Africa (Northern Cape)	5	44053–31164 BC (UCLA-706), 103–86 ka	*H. sapiens* deciduous	Berger & Libby 1966; Clark 1971; McCrossin 1994

Continued on p. 202

Appendix A (continued)

Site name, country (province if SA)	MIS	Published/calibrated dates	Assemblage/fossil designation	References
Wonderkrater, South Africa (Limpopo)	2	25.8–27.9 ka, 26.4–28.5 ka	final MSA	Backwell *et al*. 2014
Wonderkrater, South Africa (Limpopo)	3–6	30.8 ± 0.7 ka, 32.18 ± 3.6 ka, 46.3 ± 4.7 ka, 56.4 ± 4 ka, 58 ± 4.1 ka, 63.1 ± 5.8 ka, 70 ± 10 ka, 100.62 ± 7.6 ka, 102.36 ± 6.5 ka, 138.01 ± 7.7 ka	MSA	Barré *et al*. 2012; Backwell *et al*. 2014
Wonderwerk Cave, South Africa (Northern Cape)	1	AD 771–993 (Pta-2779)	ceramic final LSA	Humphreys & Thackeray 1983
Wonderwerk Cave, South Africa (Northern Cape)	1	2628–2277 BC (Pta-2785), 3798–3500 BC (Pta-2797), 6396–6086 BC (Pta-2798),	Wilton	Humphreys & Thackeray 1983
Wonderwerk Cave, South Africa (Northern Cape)	1	9695–9286 BC (Pta-2790), 10 148–9361 BC (Pta-2786)	Oakhurst	Humphreys & Thackeray 1983
Wonderwerk Cave, South Africa (Northern Cape)	5–6	73 ± 5 ka, 73.3 ± 4.8 ka, 78 ± 4 ka, 95.7 ± ka, 97 ± 3 ka, 123 ± 5 ka, 132 ± 5 ka, 141 ± 5 ka, 152 ± 9 ka, 153 ± 15 ka, 168 ± 14 ka, 155 ± 4 ka, 172 ± 15 ka, 187 ± 8 ka, 188 ± 21 ka	MSA	Vogel 2001; Beaumont & Vogel 2006; Chazan *et al*. 2020
Wonderwerk Cave, South Africa (Northern Cape)	7	220 ± 14 ka, 238 ± 13 ka	early MSA	Vogel 2001; Beaumont & Vogel 2006; Chazan *et al*. 2020
Wonderwerk Cave, South Africa (Northern Cape)	8	276 ± 29 ka, 278 ± 26 ka, 286 ± 29 ka	Fauresmith	Beaumont & Vogel 2006
Wonderwerk Cave, South Africa (Northern Cape)	13–31	490 ± 140 ka, 510 ± 140 ka, 610 ± 140 ka, 734 ± 69 ka, 760 ± 160 ka, 760 ± 170 ka, 770 ± 150 ka, 839 ± 26 ka, 860 ± 150 ka, 1.05 ± 0.160 Ma	Acheulean	Chazan *et al*. 2008; Pickering 2015; Shaar *et al*. 2021
Wonderwerk Cave, South Africa (Northern Cape)	40–56	1.15 ± 0.17 Ma, 1.3 ± 0.16 Ma, 1.53 ± 0.18 Ma, 1.61 ± 0.17 Ma	Oldowan	Chazan *et al*. 2008; Shaar *et al*. 2021
Xai Xai 2, Botswana	1	AD 202–595, AD 115–421, 175 BC–AD 248, 394–46 BC, 1224–771 BC	LSA	Yellen & Brooks 1989

REFERENCES

Adams, J.W., Herries, A.I.R., Kuykendall, K.L. & Conroy, G.C. 2007. Taphonomy of a South African cave: geological and hydrological influences on the GD 1 fossil assemblage at Gondolin, a Plio-Pleistocene paleocave system in the Northwest Province, South Africa. *Quaternary Science Reviews* 26: 2526–2543.

Ames, C.J., Gliganic, L.A., Cordova, C., Boyd, K., Jones, B.G., Maher, L. & Collins, B. 2020. Chronostratigraphy, site formation, and palaeo-environmental context of late Pleistocene and Holocene occupations at Grassridge rock shelter (Eastern Cape, South Africa). *Open Quaternary* 6: 1–19.

Archer, W., Gunz, P., Van Niekerk, K.L., Henshilwood, C.S. & McPherron, S.P. 2015. Diachronic change within the Still Bay at Blombos Cave, South Africa. *PLOS ONE* 10: e0132428.

Arponen, V.P.J., Dörfler, W., Feeser, I., Grimm, S., Groß, D., Hinz, M., Knitter, D., Müller-Scheeßel, N., Ott, K. & Ribeiro, A. 2019. Environmental determinism and archaeology. Understanding and evaluating determinism in research design. *Archaeological Dialogues* 26: 1–9.

Arthur, C., Mitchell, P., Dewar, G. & Badenhorst, S. 2018. After the silt: middle and late Holocene hunter-gatherer archaeology of the Metolong Dam, Lesotho. *Southern African Humanities* 31: 129–179.

Backwell, L.R., Dane, G.H., Gabamondi, K.J., Fenn, G.J., Names, C.M. & Pennifer, P.M. 1996. Report on the Late Iron Age site of Twyfelpoort, Free State, South Africa. *Southern African Field Archaeology* 5: 84–95.

Backwell, L., Pickering, R., Brothwell, D., Berger, L., Witcomb, M., Martill, D., Penkman, K. & Wilson, A. 2009. Probable human hair found in a fossil hyaena coprolite from Gladysvale cave, South Africa. *Journal of Archaeological Science* 36: 1269–1276.

Backwell, L., McCarthy, T., Wadley, L. Henderson, Z., Steininger, C. Chase, B., Woodborne, S., Bamford, M., Sievers, C., Brink, J. & d'Errico, F. 2014. Multiproxy record of late Quaternary climate change and Middle Stone Age human occupation at Wonderkrater, South Africa. *Quaternary Science Reviews* 99: 42–59.

Backwell, L.R., d'Errico, F., Banks, W.E., De la Peña, P., Sievers, C., Stratford, D., Lennox, S.J., Wojcieszak, M., Bordy, E.M., Bradfield, J. & Wadley, L. 2018. New excavations at Border Cave, KwaZulu-Natal, South Africa. *Journal of Field Archaeology* 43(6): 417–436.

Bada, J.L. & Deems, L. 1975. Accuracy of dates beyond the 14C dating limit using the aspartic acid racemisation reaction. *Nature* 255 (5505): 218–219.

Badenhorst, S., Mitchell, P., Arthur, C. & Capelli, C. 2019. Late Holocene fauna from Moshebi's Shelter, a Later Stone Age site in Lesotho. *Southern African Humanities* 32: 83–107.

Bader, G.D., Tribolo, C. & Conard, N.J. 2018. A return to Umbeli Belli: new insights of recent excavations and implications for the final MSA of eastern South Africa. *Journal of Archaeological Science: Reports* 21: 733–757.

Bader, G.D., Linstädter, J. & Schoeman, M.H. 2020. Uncovering the Late Pleistocene LSA of Mpumalanga Province, South Africa: early results from Iron Pig Rock Shelter. *Journal of African Archaeology* 18(1): 19–37.

Bader, G.D., Mabuza, A., Price Williams, D. & Will, M. 2022. Rethinking the Middle to Later Stone Age transition in southern Africa – A perspective from the highveld of Eswatini. *Quaternary Science Reviews* 286: 107540.

Balter, V., Blichert-Toft, J., Braga, J., Telouk, P., Thackeray, F. & Albarède, F. 2008. U–Pb dating of fossil enamel from the Swartkrans Pleistocene hominid site, South Africa. *Earth and Planetary Science Letters* 267: 236–246.

Barham, L.S. 1989. A preliminary report on the Later Stone Age artefacts from Siphiso in Swaziland. *South African Archaeological Bulletin* 44: 33–43.

Barradas, L. 1965. Cronologia da Beira-Mar do Sul de Moçambique. *Memórias do Instituto de Investigação Cientifica de Moçambique*, *Séries B* 7: 25–35.

Barradas, L. 1967. Moçambique. In: Oakley, K.P. & Campbell, B.G. (eds) *Catalogue of Fossil Hominids*, *Part I: Africa*: 35–36. London: The British Museum (Natural History).

Barré, M. & Lamothe, M. 2010. Luminescence dating of archaeosediments: a comparison of K-feldspar and plagioclase IRSL ages. *Quaternary Geochronology* 5(2–3): 324–328.

Barré, M., Lamothe, M., Backwell, L. & McCarthy, T. 2012. Optical dating of quartz and feldspars: a comparative study from Wonderkrater, a Middle Stone Age site of South Africa. *Quaternary Geochronology* 10: 374–379.

Beaumont, P.B. 1978. *Border Cave*. Unpublished MA dissertation. Cape Town: University of Cape Town.

Beaumont, P.B. 1981. The Heuningneskrans Shelter. In: Voigt, E.A. (ed.) *Guide to Archaeological Sites in the Northern and Eastern Transvaal*: 132–145. Pretoria: Southern African Association of Archaeologists.

Beaumont, P.B. 1994. Report to the KwaZulu Monuments Council on excavations at Border Cave near Ingwavuma in July–August 1987 and on the results of related investigations up until December 1993. Kimberley: McGregor Museum.

Beaumont, P. 1999. Northern Cape. *INQUA XV International Conference Field Guide*. Kimberley: McGregor Museum.

Beaumont, P.B., De Villiers, H. & Vogel, J.C. 1978. Modern man in sub-Saharan Africa prior to 49000 years BP: a review and evaluation with particular reference to Border Cave. *South African Journal of Science* 74: 409–419.

Beaumont, P.B. & Morris, D. 1990. *Guide to Archaeological Sites in the Northern Cape*. Kimberley: McGregor Museum.

Beaumont, P.B., Smith, A.B. & Vogel, J.C. 1995. Before the Einiqua: the archaeology of the frontier zone. In: Smith, A.B. (ed.) *Einiqualand: Studies of the Orange River Frontier*: 236–264. Cape Town: UCT Press.

Beaumont, P.B., Van Zinderen Bakker, E.M. & Vogel J.C. 1984. Environmental changes since 32 000 BP at Kathu Pan, northern Cape. In: Vogel, J.C. (ed.) *Late Cainozoic Palaeoclimates of the Southern Hemisphere*: 329–338. Rotterdam: Balkema.

Beaumont, P.B. & Vogel, J.C. 1972. On a new radiocarbon chronology for Africa south of the equator. *African Studies* 31: 65–89, 155–182.

Beaumont, P.B. & Vogel, J.C. 1989. Patterns in the age and context of rock art in the Northern Cape. *South African Archaeological Bulletin* 44: 73–81.

Beaumont, P.B. & Vogel, J.C. 2006. On a timescale for the past million years of human history in central South Africa. *South African Journal of Science* 102: 217–228.

Berger, L.R., Hawks, J., De Ruiter, D.J., Churchill, S.E., Schmid, P., Delezene, L.K., Kivell, T.L., Garvin, H.M., Williams, S.A., DeSilva, J.M., Skinner, M.M., Musiba, C.M., Cameron, N., Holliday, T.W., Harcourt-Smith, W., Ackermann, R.R., Bastir, M., Bogin, B., Bolter, D., Brophy, J., Cofran, Z.D., Congdon, K.A., Deane, A.S., Dembo, M., Drapeau, M., Elliott, M.C., Feuerriegel, E.M., Garcia-Martinez, D., Green, D.J., Gurtov, A., Irish, J.D., Kruger, A., Laird, M.F., Marchi, D., Meyer, M.R., Nalla, S., Negash, E.W., Orr, C.M., Radovcic, D., Schroeder, L., Scott, J.E., Throckmorton, Z., Tocheri, M.W., Vansickle, C., Walker, C.S., Wei, P. & Zipfel, B. 2015. *Homo naledi*, a new species of the genus *Homo* from the Dinaledi Chamber, South Africa. *eLife* 4: e09560.

Berger, L.R., Hawks, J., Dirks, P.H.G.M., Elliott, M. & Roberts, E.M. 2017. *Homo naledi* and Pleistocene hominin evolution in subequatorial Africa. *eLife* 6: e24234.

Berger, R. & Libby, W.F. 1966. UCLA Radiocarbon dates V. *Radiocarbon* 8: 467–497.

Bicho, N., Cascalheira, J., Haws, J. & Gonçalves, C. 2018. Middle Stone Age technologies in Mozambique: a preliminary study of the Niassa and Massingir regions. *Journal of African Archaeology* 16: 60–82.

Binneman, J. 1997. Results from a test excavation at the Havens Cave, Cambria Valley, south-eastern Cape. *Southern African Field Archaeology* 6: 93–105.

Binneman, J. 2004/2005. Archaeological research along the south-eastern Cape coast part 1: open-air shell middens. *Southern African Field Archaeology* 13 & 14: 49–77.

Binneman, J. 2006/2007. Archaeological research along the south-eastern Cape coast part 2, caves and rock shelters: Kabeljous River Shelter 1 and associated stone tool industries. *Southern African Field Archaeology* 15 & 16: 57–74.

Bousman, B. & Brink, J. 2018. The emergence, spread, and termination of the Early Later Stone Age event in South Africa and southern Namibia. *Quaternary International* 495: 116–135.

Bradfield, J., Holt, S. & Sadr, K. 2009. The last of the LSA on the Makgabeng Plateau, Limpopo Province. *South African Archaeological Bulletin* 64: 176–183.

Brenner, M.J. & Wurz, S. 2019. A high-resolution perspective on MIS5c-d lithic assemblages from Klasies River main site Cave 1. *Journal of Archaeological Science: Reports* 26: 101891.

Brink, J. & Webley, L. 1996. Faunal evidence for pastoralist settlement at Jakkalsberg, Richtersveld, Northern Cape Province. *Southern African Field Archaeology* 5: 70–78.

Brink, J.S., Herries, A.I.R., Moggi-Cecchi, J., Gowlett, J.A., Bousman, C.B., Hancox, J.P., Grün, R., Eisenmann, V., Adams, J.W. & Rossouw, L. 2012. First hominine remains from a ~1.0 million-year-old bone bed at Cornelia-Uitzoek, Free State Province, South Africa. *Journal of Human Evolution* 63: 527–535.

Brook, G.A., Srivastava, P., Brook, F.Z., Robbins, L.H., Campbell, A.C. & Murphy, M.L. 2008. OSL chronology for sediments and MSA artefacts at the Toteng quarry, Kalahari Desert, Botswana. *South African Archaeological Bulletin* 63(188): 151–158.

Brooks, A.S., Hare, P.E., Kokis, J.E., Miller, G.H., Ernst, R.D. & Wendorf, F. 1990. Dating Pleistocene archeological sites by protein diagenesis in ostrich eggshell. *Science* 248(4951): 60–64.

Brooks, A.S., Hare, P.E. & Kokis, J.E. 1993. Age of anatomically modern human fossils from the cave of Klasies River Mouth, South Africa. *Carnegie Institution Year Books* 92: 95–96.

Brown, K.S., Marean, C.W., Jacobs, Z., Schoville, B.J., Oestmo, S., Fisher, E.C., Bernatchez, J., Karkanas, P. & Matthews, T. 2012. An early and enduring advanced technology originating 71,000 years ago in South Africa. *Nature* 491(7425): 590–593.

Bruner, E. & Lombard, M. 2020. The skull from Florisbad: a paleoneurological report. *Journal of Anthropological Science* 98: 89–97.

Bruxelles, L., Clarke, R.J., Maire, R., Ortega, R. & Stratford, D. 2014. Stratigraphic analysis of the Sterkfontein StW 573 *Australopithecus* skeleton and implications for its age. *Journal of Human Evolution* 70: 36–48.

Cable, J.H.C., Scott, K. & Carter, P.L. 1980. Excavations at Good Hope Shelter, Underberg District, Natal. *Annals of the Natal Museum* 24: 1–34.

Caley, T., Extier, T., Collins, J.A., Schefuß, E., Dupont, L., Malaizé, B., Rossignol, L., Souron, A., McClymont, E.L., Jimenez-Espejo, F.J. & García-Comas, C. 2018. A two-million-year-long hydroclimatic context for hominin evolution in southeastern Africa. *Nature* 560 (7716): 76–79.

Carter, P.L. & Vogel, J.C. 1974. The dating of industrial assemblages from stratified sites in eastern Lesotho. *Man* 9: 557–570.

Caruana, M., Van der Walt, J. & Lombard, M. 2020. Evidence of Earlier Stone Age occurrences on the Barberspan Highveld landscape, North West Province, South Africa. *South African Archaeological Bulletin* 75: 49–57.

Chase, B.M., Faith, J.T., Mackay, A., Chevalier, M., Carr, A.S., Boom, A., Lim, S. & Reimer, P.J. 2018. Climatic controls on Later Stone Age human adaptation in Africa's southern Cape. *Journal of Human Evolution* 114: 35–44.

Chazan, M. 2015. Technological trends in the Acheulean of Wonderwerk Cave, South Africa. *African Archaeological Review* 32: 701–728.

Chazan, M., Berna, F., Brink, J., Ecker, M., Holt, S., Porat, N., Thorp, J.L. & Horwitz, L.K. 2020. Archeology, environment, and chronology of the Early Middle Stone Age component of Wonderwerk Cave. *Journal of Paleolithic Archaeology* 3(3): 302–335.

Chazan, M., Porat, N., Sumner, T.A. & Horwitz, L.K. 2013. The use of OSL dating in unstructured sands: the archaeology and chronology of the Hutton Sands at Canteen Kopje (Northern Cape Province, South Africa). *Archaeological and Anthropological Sciences* 5(4): 351–363.

Chazan, M., Ron, H., Matmon, A., Porat, N., Goldberg, P., Yates, R., Avery, M., Sumner, A. & Horwitz, L.K. 2008. Radiometric dating of the Earlier Stone Age sequence in excavation I at Wonderwerk Cave,

South Africa: preliminary results. *Journal of Human Evolution* 55: 1–11.
Cheng, H., Lawrence Edwards, R., Shen, C-C., Polyak, V.J., Asmerom, Y., Woodhead, J., Hellstrom, J., Wang, Y., Kong, X., Spötl, C., Wang, X. & Calvin Alexander, E. 2013. Improvements in ^{230}Th dating, ^{230}Th and ^{234}U half-life values, and U–Th isotopic measurements by multi-collector inductively coupled plasma mass spectrometry. *Earth and Planetary Science Letters* 371–372: 82–91.
Churchill, S.E., Pearson, O.M., Grine, F.E., Trinkaus, E. & Holliday, T.W. 1996. Morphological affinities of the proximal ulna from Klasies River main site: archaic or modern? *Journal of Human Evolution* 31: 213–237.
Clark, A.M.B. 1999. Late Pleistocene technology at Rose Cottage Cave: a search for modern behaviour in an MSA context. *African Archaeological Review* 16: 93–119.
Clark, J.D. 1954. *The Prehistoric Cultures of the Horn of Africa*. Cambridge: Cambridge University Press.
Clark, J.D. 1971. Human behavioral differences in southern Africa during the Later Pleistocene. *American Anthropologist* 73: 1211–1236.
Clark, J.D. & Fagan, B.M. 1965. Charcoals, sands, and channel decorated pottery from Northern Rhodesia. *American Anthropologist* 67: 354–371.
Clark, J.L. & Kandel, A.W. 2013. The evolutionary implications of variation in human hunting strategies and diet breadth during the Middle Stone Age of southern Africa. *Current Anthropology* 54: S269–S287.
Clarke, D.L. 1968. *Analytical Archaeology*. London: Methuen.
Conard, N.J. & Porraz, G. 2015. Revising models for the cultural stratigraphic sequence of the Middle Stone Age. *South African Archaeological Bulletin* 70: 127–130.
Cooke, C.K. 1979. Excavation at Diana's Vow Rock Shelter, Makoni district Zimbabwe Rhodesia. *Occasional Papers of the National Museum of Southern Rhodesia*. *A*, *Human Sciences* 4(4): 115–148.
Curnoe, D. 2009. The Bed 3 mandible. In: Mcnabb, J. & Sinclair, A. (eds) *The Cave of Hearths: Makapan Middle Pleistocene Research Project*: 138–149. Oxford: Archaeopress.
Curnoe, D. 2010. A review of early *Homo* in southern Africa focusing on cranial, mandibular and dental remains, with the description of a new species (*Homo gautengensis* sp. nov.). *HOMO – Journal of Comparative Human Biology* 61: 151–177.
Curnoe, D., Grün, R., Taylor, L. & Thackeray, F. 2001. Direct ESR dating of a Pliocene hominin from Swartkrans. *Journal of Human Evolution* 40: 379–391.
Curnoe, D., Herries, A., Brink, J., Hopley, P., Van Reyneveld, K., Henderson, Z. & Morris, D. 2006. Discovery of Middle Pleistocene fossil and stone tool-bearing deposits at Groot Kloof, Ghaap escarpment, Northern Cape province: news & views. *South African Journal of Science* 102: 180–184.
Dart, R. & Beaumont, P. 1971. On a further radiocarbon date for ancient mining in southern Africa. *South African Journal of Science* 1971: 10.
Curnoe, D. & Tobias, P.V. 2006. Description, new reconstruction, comparative anatomy, and classification of the Sterkfontein Stw 53 cranium, with discussions about the taxonomy of other southern African early *Homo* remains. *Journal of Human Evolution* 50: 36–77.
Davidson, I. 2020. IMHO: Inventing human origins. In: Porr, M. & Matthews, J.M. (eds) *Interrogating Human Origins: Decolonisation and the Deep Past*: 35–55. New York: Routledge.
Davies, O. 1975. Excavation at Shongeni South Cave. *Annals of the Natal Museum* 22: 627–662.
Deacon, H.J. 1967. Two radiocarbon dates from Scott's Cave, Gamtoos Valley. *South African Archaeological Bulletin* 22: 51–52.
Deacon, H.J. 1972. A review of the post-Pleistocene in South Africa. *South African Archaeological Society Goodwin Series* 1: 26–45.
Deacon, H.J. 1976. *Where Hunters Gathered: a Study of Holocene Stone Age People in the Eastern Cape*. Cape Town: South African Archaeological Society Monograph Series 1.
Deacon, H.J. 1979. A sequence through the Upper Pleistocene and Holocene in South Africa. *World Archaeology* 10: 241–257.
Deacon, H.J. 2008. The context of the 1967–8 sample of human remains from Cave 1 Klasies River Main Site. *South African Archaeological Society Goodwin Series* 10: 143–149.
Deacon, J., 1978. Changing patterns in the Late Pleistocene/Early Holocene prehistory of southern Africa as seen from the Nelson Bay Cave stone artifact sequence. *Quaternary Research* 10(1): 84–111.
Deacon, J. 1980. Comments on Parkington: Time and place: some observations on spatial and temporal patterning in the Later Stone Age sequence in South Africa. *South African Archaeological Bulletin* 35: 89–93.
Deacon, J. 1982. The Later Stone Age in the Southern Cape, South Africa. Unpublished PhD thesis. Cape Town: University of Cape Town.
Deacon, J. 1984. *The Later Stone Age of Southernmost Africa*. BAR International Series, 213. Oxford: Archaeopress.
Deacon H.J. & Deacon, J. 1963. Scott's Cave: a late Stone Age site in the Gamtoos Valley. *Annals of the Cape Provincial Museums* 3: 96–121.
Deino, A.L. 2013. Geochronology. In: Begun, D.R. (ed.) *A Companion to Paleoanthropology*: 244–264. Oxford: Blackwell Publishing.
De la Peña, P., Val, A., Stratford, D.J., Colino, F., Esteban, I., Fitchett, J.M., Hodgskiss, T., Matembo, J. & Moll, R. 2019. Revisiting Mwulu's Cave: new insights into the Middle Stone Age in the southern African savanna biome. *Archaeological and Anthropological Sciences* 11(7): 3239–3266.
De Ruiter, D.J., Pickering, R., Steininger, C.M., Kramers, J.D., Hancox, P.J., Churchill, S.E., Berger, L.R. & Backwell, L. 2009. New *Australopithecus robustus* fossils and associated U–Pb dates from Cooper's cave (Gauteng, South Africa). *Journal of Human Evolution* 56: 497–513.
d'Errico, F. & Backwell, L. 2016. Earliest evidence of personal ornaments associated with burial: the *Conus* shells from Border Cave. *Journal of Human Evolution* 93: 91–108.
Dewar, G. & Stewart, B. 2016. Early maritime desert dwellers in Namaqualand, South Africa: a Holocene perspective on Pleistocene peopling. *Journal of Island and Coastal Archaeology* 12: 44–64.
Dibble, H.L., Aldeias, V., Jacobs, Z., Olszewski, D.I., Rezek, Z., Lin, S.C., Alvarez-Fernández, E., Barshay-Szmidt, C.C., Hallett-Desguez, E., Reed, D. & Reed, K. 2013. On the industrial attributions of the Aterian and Mousterian of the Maghreb. *Journal of Human Evolution* 64(3): 194–210.
Dirks, P.H.G.M., Kibii, J.M., Kuhn, B.F., Steininger, C., Churchill, S.E., Kramers, J. D., Pickering, R., Farber, D.L., Mériaux, A-S., Herries, A.I.R., King, G.C.P. & Berger, L.R. 2010. Geological setting and age of *Australopithecus sediba* from southern Africa. *Science* 328: 205–208.
Dirks, P.H.G.M., Roberts, E.M., Hilbert-Wolf, H., Kramers, J.D., Hawks, J., Dosseto, A., Duval, M., Elliott, M., Evans, M., Grün, R., Hellstrom, J., Herries, A.I.R., Joannes-Boyau, R., Makhubela, T.V., Placzek, C.J., Robbins, J., Spandler, C., Wiersma, J., Woodhead, J. & Berger, L.R. 2017. The age of *Homo naledi* and associated sediments in the Rising Star Cave, South Africa. *eLife* 6: e24231.
Döckel, W. 1998. Re-investigation of the Matjes River Rock Shelter. Unpublished MA dissertation. Stellenbosch: University of Stellenbosch.
Doran, T.L., Herries, A.I., Hopley, P.J., Sombroek, H., Hellstrom, J., Hodge, E. & Kuhn, B.F. 2015. Assessing the paleoenvironmental potential of Pliocene to Holocene tufa deposits along the Ghaap Plateau escarpment (South Africa) using stable isotopes. *Quaternary Research* 84(1): 133–143.
Douze, K. & Delagnes, A. 2016. 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* 91: 93–121.
Dreyer, T.F. 1935. A human skull from Florisbad, Orange Free State, with a note on the endocranial cast, by CU Ariens Kappers. *Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen* 38: 3–12.
Dusseldorp, G.L. 2016. Faunal assemblage structure suggests a limited impact of the introduction of domestic stock on Later Stone Age subsistence economies in South Africa. *African Archaeological Review* 33: 363–383.
Dusseldorp, G.L. & Lombard, M. 2021. Constraining the likely technological niches of Late Middle Pleistocene hominins with *Homo naledi* as case study. *Journal of Archaeological Method and Theory* 28: 11–52.
Dusseldorp, G.L., Lombard, M. & Wurz, S. 2013. Pleistocene *Homo* and the updated Stone Age sequence of South Africa. *South African Journal of Science* 109: Art #0042.
Ecker, M., Brink, J., Chazan, M., Kolska Horwitz, L. & Lee-Thorp, J.A. 2017. Radiocarbon dates constrain the timing of environmental and cultural shifts in the Holocene strata of Wonderwerk Cave, South Africa. *Radiocarbon* 59: 1067–1086.
Eggins, S.M., Grün, R., McCulloch, M.T., Pike, A.W., Chappell, J., Kinsley, L., Mortimer, G., Shelley, M., Murray-Wallace, C.V., Spötl, C. & Taylor, L. 2005. In situ U-series dating by laser-ablation multi-collector ICPMS: new prospects for Quaternary geochronology. *Quaternary Science Reviews* 24: 2523–2538.
Eltzholtz, A.K. 2020. Investigating temporal change in Fauresmith technology: insights from Rooidam 2, Northern Cape Province, South

Africa. Unpublished MA dissertation. Cape Town: University of Cape Town.
Esterhuysen, A.B., Behrens, J. & Harper, P.T. 1994. Leliehoek Shelter: a Holocene sequence from the eastern Orange Free State. *South African Archaeological Bulletin* 49: 73–78.
Feathers, J.K. 1997. Luminescence dating of sediment samples from White Paintings Rockshelter, Botswana. *Quaternary Science Reviews* 16(3–5): 321–331.
Feathers, J.K. 2002. Luminescence dating in less-than-ideal conditions: case studies from Klasies River main site and Duinefontein, South Africa. *Journal of Archaeological Science* 29: 177–194.
Feathers, J. 2015. Luminescence dating at Diepkloof Rock Shelter – new dates from single-grain quartz. *Journal of Archaeological Science* 63: 164–174.
Feathers, J.K. & Bush, D.A. 2000. Luminescence dating of middle stone age deposits at Die Kelders. *Journal of Human Evolution* 38(1): 91–119.
Feathers, J.K., Evans, M., Stratford, D.J. & De la Peña, P. 2020. Exploring complexity in luminescence dating of quartz and feldspars at the Middle Stone Age site of Mwulu's Cave (Limpopo, South Africa). *Quaternary Geochronology* 59: 101092.
Fekadu, K. 2014. The paradox in environmental determinism and possibilism: a literature review. *Journal of Geography and Regional Planning* 7: 132–139.
Fisher, E.C., Cawthra, H.C., Esteban, I., Jerardino, A., Neumann, F.H., Oertle, A., Pargeter, J., Saktura, R.B., Szabó, K., Winkler, S. & Zohar, I. 2020. Coastal occupation and foraging during the last glacial maximum and early Holocene at Waterfall Bluff, eastern Pondoland, South Africa. *Quaternary Research* 97: 1–41.
Forssman, T. 2014. Dzombo shelter: a contribution to the Later Stone Age sequence of the greater Mapungubwe landscape. *South African Archaeological Bulletin* 69: 182–191.
Forssman, T., Kuman, K., Leader, G. & Gibbon, R. 2010. A Later Stone Age assemblage from canteen Kopje, Northern Cape. *South African Archaeological Bulletin* 65: 204–214.
Fujioka, T., Benito-Calvo, A., Mora, R., McHenry, L., Njau, J.K. & Torre, I.D.L. 2022. Direct cosmogenic nuclide isochron burial dating of early Acheulian stone tools at the T69 Complex (FLK West, Olduvai Bed II, Tanzania). *Journal of Human Evolution* 165: 103155.
Galway-Witham, J., Cole, J. & Stringer, C. 2019. Aspects of human physical and behavioural evolution during the last 1 million years. *Journal of Quaternary Science* 34(6): 355–378.
Gibbon, R.J., Pickering, T.R., Sutton, M.B., Heaton, J.L., Kuman, K., Clarke, R.J., Brain, C.K. & Granger, D.E. 2014. Cosmogenic nuclide burial dating of hominin-bearing Pleistocene cave deposits at Swartkrans, South Africa. *Quaternary Geochronology* 24: 10–15.
Granger, D.E. 2014. Cosmogenic nuclide burial dating in archaeology and paleoanthropology. In: Holland, H.D. & Turekian, K.K. (eds) *Treatise on Geochemistry (Second Edition)*: 81–97. Oxford: Elsevier.
Granger, D.E., Gibbon, R.J., Kuman, K., Clarke, R.J., Bruxelles, L. & Caffee, M.W. 2015. New cosmogenic burial ages for Sterkfontein member 2 *Australopithecus* and member 5 Oldowan. *Nature* 522: 85–88.
Granger, D.E., Lifton, N.A. & Willenbring, J.K. 2013. A cosmic trip: 25 years of cosmogenic nuclides in geology. *GSA Bulletin* 125: 1379–1402.
Grine, F.E. 1989. New hominid fossils from the Swartkrans formation (1979–1986 excavations): craniodental specimens. *American Journal of Physical Anthropology* 79: 409–449.
Grine, F.E. 2000. Middle Stone Age human fossils from Die Kelders Cave 1, Western Cape Province, South Africa. *Journal of Human Evolution* 38: 129–145.
Grine, F.E. 2012. Observations on Middle Stone Age human teeth from Klasies River Main Site, South Africa. *Journal of Human Evolution* 63: 750–758.
Grine, F.E., Bailey, R.M., Harvati, K., Nathan, R.P., Morris, A.G., Henderson, G.M., Ribot, I. & Pike, A.W.G. 2007. Late Pleistocene human skull from Hofmeyr, South Africa, and modern human origins. *Science* 315: 226–229.
Grine, F.E. & Henshilwood, C.S. 2002. Additional human remains from Blombos Cave, South Africa: (1999–2000 excavations). *Journal of Human Evolution* 42: 293–302.
Grine, F.E., Henshilwood, C.S. & Sealy, J.C. 2000. Human remains from Blombos Cave, South Africa: (1997–1998 excavations). *Journal of Human Evolution* 38: 755–765.
Grine, F.E. & Klein, R.G. 1985. Pleistocene and Holocene human remains from Equus Cave, South Africa. *Anthropology* 8: 55–98.
Grine, F., Mongle, C., Smith, S., Black, W., Du Plessis, A. & Braga, J. 2020. Human manual distal phalanges from the Middle Stone Age deposits of Klasies River Main Site, Western Cape Province, South Africa. *Journal of Human Evolution* 146: 102849.
Grine, F.E., Wurz, S. & Marean, C.W. 2017. The Middle Stone Age human fossil record from Klasies River Main Site. *Journal of Human Evolution* 103: 53–78.
Grün, R., Beaumont, P., Tobias, P.V. & Eggins, S. 2003. On the age of Border Cave 5 human mandible. *Journal of Human Evolution* 45(2): 155–167.
Grün, R.J., Brink, J.S., Spooner, N.A., Taylor, L., Stringer, C.B., Franciscus, R.G. & Murray, A.S. 1996. Direct dating of the Florisbad hominid. *Nature* 382: 500–501.
Grün, R., Shackleton, N.J. & Deacon, H.J. 1990. Electron-spin-resonance dating of tooth enamel from Klasies River Mouth Cave. *Current Anthropology* 31(4): 427–432.
Halkett, D., Hart, T., Nillsen, P., Avery, G., Poggenpoel, C., Jephta, E. & Sassa, M. 1993. *Excavations at six archaeological sites in the near shore diamond mining area, Brandsebaai, Namaqualand*. Unpublished report prepared for the De Beers Namaqualand Mines Division. Cape Town: Archaeological Contracts Office, University of Cape Town.
Harvati, K., Bauer, C.C., Grine, F.E., Benazzi, S., Ackermann, R.R., Van Niekerk, K.L. & Henshilwood, C.S. 2015. A human deciduous molar from the Middle Stone Age (Howiesons Poort) of Klipdrift Shelter, South Africa. *Journal of Human Evolution* 82: 190–196.
Helgren, D.M. 1984. Historical geomorphology and geoarchaeology in the southwestern Makgadikgadi Basin, Botswana. *Annals of the Association of American Geography* 74(2): 298–307.
Henderson, Z., Scott, L., Rossouw, L. & Jacobs, Z. 2006. Dating, paleoenvironments, and archaeology: a progress report on the Sunnyside 1 site, Clarens, South Africa. *Archaeological Papers of the American Anthropological Association* 16: 139–149.
Henshilwood, C.S. 2008. *Holocene Prehistory of the Southern Cape, South Africa: Excavations at Blombos Cave and the Blombosfontein Nature Reserve*. Oxford: British Archaeological Reports International Series 1860.
Henshilwood, C.S., d'Errico, F., Van Niekerk, K.L., Coquinot, Y., Jacobs, Z., Lauritzen, S.E., Menu, M. & García-Moreno, R. 2011. A 100,000-year-old ochre-processing workshop at Blombos Cave, South Africa. *Science* 334(6053): 219–222.
Henshilwood, C.S., Van Niekerk, K.L., Wurz, S., Delagnes, A., Armitage, S.J., Rifkin, R.F., Douze, K., Keene, P., Haaland, M.M., Reynard, J. & Discamps, E. 2014. Klipdrift shelter, southern Cape, South Africa: preliminary report on the Howiesons Poort layers. *Journal of Archaeological Science* 45: 284–303.
Herbert, A.V. & Fitchett, J.M. 2022. Synthesising the pollen records for the Drakensberg-Maloti through quantitative modelling. *Quaternary International* 611–612: 77–86.
Herries, A.I.R., Arnold, L., Boschian, G., Blackwood, A., Wilson, C., Mallett, T., Armstrong, B., Demuro, M., Petchy, F., Meredith-Williams, M., Penzo-Kajewski, P. & Caruana, M.V. 2022. A marine isotope stage 11 coastal Acheulian workshop with associated wood at Amanzi Springs Area 1, South Africa. *PLOS ONE*, 17(10), p.e0273714..
Herries, A.I.R., Martin, J., Leece, A. B., Adams, J., Boschian, G., Joannes-Boyau, R., Edwards, T., Mallett, T., Massey, J., Murszewski, A., Neubauer, S., Pickering, R., Strait, D., Armstrong, B., Baker, S., Caruana, M., Denham, T., Hellstrom, J., Moggi-Cecchi, J., Mokobane, S., Penzo-Kajewski, P., Rovinsky Douglass, S., Schwartz, G., Stammers, R., Wilson, C., Woodhead, J. & Menter, C. 2020. Contemporaneity of *Australopithecus*, *Paranthropus*, and early *Homo erectus* in South Africa. *Science* 368: 7293.
Herries, A.I.R. & Shaw, J. 2011. Palaeomagnetic analysis of the Sterkfontein palaeocave deposits: implications for the age of the hominin fossils and stone tool industries. *Journal of Human Evolution* 60: 523–539.
Högberg, A. & Larsson, L. 2011. Lithic technology and behavioural modernity: new results from the Still Bay site, Hollow Rock Shelter, Western Cape Province, South Africa. *Journal of Human Evolution* 61: 133–155.
Högberg, A. & Lombard, M. 2016. Still Bay point-production strategies at Hollow Rock Shelter and Umhlatuzana Rock Shelter and knowledge-transfer systems in southern Africa at about 80–70 thousand years ago. *PLOS ONE* 11(12): 0168012.
Högberg, A. & Lombard, M. 2020. 'I can do it' becomes 'We do it': Kimberley (Australia) and Still Bay (South Africa) points through a

socio-technical framework lens. *Journal of Paleolithic Archaeology* 3: 633–663.
Högberg, A. & Lombard, M. 2022. Was there a shift from Levallois to Still Bay point knapping at Hollow Rock Shelter, South Africa? *Azania: Archaeological Research in Africa* 57: 5–36.
Humphreys, A.J.B. & Thackeray, A.I. 1983. *Ghaap and Gariep: Later Stone Age Studies in the Northern Cape*. Cape Town: South African Archaeological Society Monograph Series 2.
Hutson, J.M. 2018. The faunal remains from Bundu Farm and Pniel 6: examining the problematic Middle Stone Age archaeological record within the southern African interior. *Quaternary International* 466: 178–193.
Inskeep, R.R. 1987. *Nelson Bay Cave, Cape Province, South Africa: the Holocene Levels*. Oxford: British Archaeological Reports International Series 357.
Ivester, A.H., Brook, G.A., Robbins, L.H., Campbell, A.C., Murphy, M.L. & Marais, E. 2010. A sedimentary record of environmental change at Tsodilo Hills White Paintings Rock Shelter, Northwest Kalahari Desert, Botswana. *Palaeoecology of Africa* 30: 53–78.
Jacobs, Z. 2010. An OSL chronology for the sedimentary deposits from Pinnacle Point Cave 13B – a punctuated presence. *Journal of Human Evolution* 59: 289–305.
Jacobs, Z., Jones, B.G., Cawthra, H.C., Henshilwood, C.S. & Roberts, R.G. 2020. The chronological, sedimentary and environmental context for the archaeological deposits at Blombos Cave, South Africa. *Quaternary Science Reviews* 235: 105850.
Jacobs, Z. & Roberts, R.G. 2017. Single-grain OSL chronologies for the Still Bay and Howieson's Poort industries and the transition between them: further analyses and statistical modelling. *Journal of Human Evolution* 107: 1–13.
Jacobs, Z., Roberts, R.G., Galbraith, R.F., Deacon, H.J., Grün, R., Mackay, A., Mitchell, P.J., Vogelsang, R. & Wadley, L. 2008. Ages for the Middle Stone Age of southern Africa: implications for human behaviour and dispersal. *Science* 322: 733–735.
Jacobs, Z., Wintle, A.G., Duller, G.A.T., Roberts, R.G. & Wadley, L. 2008. New ages for the post-Howieson's Poort, late and final Middle Stone Age at Sibudu Cave, South Africa. *Journal of Archaeological Science* 35: 1790–1807.
Jerardino, A., Fort, J., Isern, N. & Rondelli, B. 2014. Cultural diffusion was the main driving mechanism of the Neolithic transition in southern Africa. *PLOS ONE* 9: e113672.
Jerardino, A., Kaplan, J., Navarro, R. & Nilssen, P. 2016. Filling in the gaps and testing past scenarios on the central west coast: hunter-gatherer subsistence and mobility at 'Deurspring 16' shell midden, Lamberts Bay, South Africa. *South African Archaeological Bulletin* 71(203): 71–86.
Jerardino, A. & Maggs, T. 2007. Simon se Klip at Steenbokfontein: the settlement pattern of a built pastoralist encampment on the west coast of South Africa. *South African Archaeological Bulletin* 62: 104–114.
Jerardino, A. & Navarro, R. 2018a. Large-scale hunter-gatherer exploitation of marine resources in South Africa, Part 1: 'Kreefbaai C' megamidden, Lamberts Bay area. *South African Archaeological Bulletin* 73: 93–107.
Jerardino, A. & Navarro, R. 2018b. Large-scale hunter-gatherer exploitation of marine resources in South Africa, Part 2: Grootrif and Malkoppan megamiddens, Lamberts Bay area. *South African Archaeological Bulletin* 73: 108–125.
Jerardino, A., Navarro, R., Orton, J., Button, R., Halkett, D., Webley, L., Tusenius, M., Hoffman, T. & February, E. 2018. Late Holocene climatic and cultural variability at a focal point of settlement near Lamberts Bay, South Africa: test excavations at Soutpansklipheuwel. *South African Archaeological Bulletin* 73(207): 13–34.
Jerardino, A. & Yates, R. 1996. Preliminary results from excavations at Steenbokfontein Cave: implications for past and future research. *South African Archaeological Bulletin* 51: 7–16.
Kaplan, J. 1990. The Umhlatuzana Rock Shelter sequence: 100 000 years of Stone Age history. *Natal Museum Journal of Humanities* 2: 1–94.
Kaplan, J. & Mitchell, P. 2012. The archaeology of the Lesotho Highlands Water Project Phases IA and IB. *Southern African Humanities* 24: 1–32.
Karkanas, P., Brown, K.S., Fisher, E.C., Jacobs, Z. & Marean, C.W. 2015. Interpreting human behavior from depositional rates and combustion features through the study of sedimentary microfacies at site Pinnacle Point 5-6, South Africa. *Journal of Human Evolution* 85: 1–21.
Keyser, A.W., Menter, C.G., Moggi-Cecchi, J., Pickering, T.R. & Berger, L.R. 2000. Drimolen: a new hominid-bearing site in Gauteng. *South African Journal of Science* 96: 193–197.
Kiberd, P. 2006. Bundu Farm: a report on archaeological and palaeoenvironmental assemblages from a pan site in Bushmanland, Northern Cape, South Africa. *South African Archaeological Bulletin* 61: 189–201.
Kinahan, J. 2018. A ritual assemblage from the third millennium BC in the Namib Desert and its implications for the archaeology and rock art of shamanic performance. *Azania: Archaeological Research in Africa* 53: 40–62.
Klatzow, S. 2000. Interaction between hunter-gatherers and agriculturalists in the eastern Free State. Unpublished MA dissertation. Johannesburg: University of the Witwatersrand.
Klatzow, S. 2010. Interaction between hunter-gatherers and Bantu-speaking farmers in the eastern Free State: a case study from De Hoop Cave. *South African Historical Journal* 62: 229–251.
Klein, R.G. 2017. Language and human evolution. *Journal of Neurolinguistics* 43: 204–221.
Klein, R.G. 2019. Population structure and the evolution of *Homo sapiens* in Africa. *Evolutionary Anthropology: Issues, News, and Reviews* 28(4): 179–188.
Klein, R.G., Avery, G., Cruz-Uribe, K., Halkett, D., Hart, T., Milo, R.G. & Volman, T.P. 1999. Duinefontein 2: an Acheulean site in the Western Cape Province of South Africa. *Journal of Human Evolution* 37: 153–190.
Kramers, J.D. & Dirks, P.H.G.M. 2017a. The age of fossil StW573 ('Little Foot'): an alternative interpretation of 26Al/10Be burial data. *South African Journal of Science* 113: 1–8.
Kramers, J.D. & Dirks, P.H.G.M. 2017b. The age of fossil StW573 ('Little Foot'): Reply to comments by Stratford *et al*. (2017). *South African Journal of Science* 113: 1–3.
Kuman, K.A. 1989. Florisbad and Gi: the contribution of open-air sites to study of the Middle Stone Age in southern Africa. Unpublished PhD thesis. Philadephia: University of Pennsylvania.
Kuman, K. & Clarke, R.J. 2000. Stratigraphy, artifact industries and hominid associations for Sterkfontein, Member 5. *Journal of Human Evolution* 38: 827–847.
Kuman, K., Inbar, M. & Clarke, R.J. 1999. Palaeoenvironments and cultural sequence of the Florisbad Middle Stone Age hominid site, South Africa. *Journal of Archaeological Science* 26: 1409–1425.
Kuman, K., Granger, D.E., Gibbon, R.J., Pickering, T.R., Caruana, M.V., Bruxelles, L., Clarke, R.J., Heaton, J.L., Stratford, D. & Brain, C.K. 2021. A new absolute date from Swartkrans Cave for the oldest occurrences of *Paranthropus robustus* and Oldowan stone tools in South Africa. *Journal of Human Evolution* 156: 103000.
Kuman, K., Lotter, M.G. & Leader, G.M. 2020. The Fauresmith of South Africa: a new assemblage from Canteen Kopje and significance of the technology in human and cultural evolution. *Journal of Human Evolution* 148: 102884.
Lacruz, R.S., Brink, J.S., Hancox, P.J., Skinner, A.R., Herries, A., Schmid, P. & Berger, L.R. 2002. Palaeontology and geological context of a Middle Pleistocene faunal assemblage from the Gladysvale Cave, South Africa. *Palaeontologia africana* 38: 99–114.
Langejans, G.H.J., Dusseldorp, G.L. & Thackeray, J.F. 2017. Pleistocene molluscs from Klasies River (South Africa): reconstructing the local coastal environment. *Quaternary International* 427, Part A: 59–84.
Latham, A. & Herries, A.I.R. 2009. Archaeomegnetic studies at the Cave of Hearths. In: McNabb, J. & Sinclair, A. (eds) *The Cave of Hearths: Makapan Middle Pleistocene Research Project*: 59–64. BAR International Series. Oxford: Oxbow Press.
Leader, G.M. 2014. New excavations at Canteen Kopje, Northern Cape Province, South Africa: a techno-typological comparison of three earlier Acheulean assemblages with new interpretations on the Victoria West phenomenon. Unpublished PhD thesis. Johannesburg: University of the Witwatersrand.
Leader, G.M., Kuman, K., Gibbon, R.J. & Granger, D.E. 2018. Early Acheulean organised core knapping strategies ca. 1.3 Ma at Rietputs 15, Northern Cape Province, South Africa. *Quaternary International* 480: 16–28.
Leslie-Brooker, M. 1987. An archaeological study of the Uniondale Rockshelter, Albany district, Eastern Cape. Unpublished MA dissertation. Stellenbosch: University of Stellenbosch.
Li, H., Kuman, K., Leader, G.M. & Couzens, R. 2018. Handaxes in South Africa: two case studies in the early and later Acheulean. *Quaternary International* 480: 29–42.

Linick, T.W. 1977. La Jolla natural radiocarbon measurements VII. *Radiocarbon* 19: 19–48.

Lisiecki, L.E. & Raymo, M.E. 2005. A Pliocene-Pleistocene stack of 57 globally distributed benthic δ18O records. *Paleoceanography* 20: PA1003.

Loftus, E., Stewart, B.A., Dewar, G. & Lee-Thorp, J. 2015. Stable isotope evidence of late MIS3 to middle Holocene palaeoenvironments from Sehonghong Rockshelter, eastern Lesotho. *Journal of Quaternary Science* 30: 805–816.

Loftus, E., Mitchell, P. & Ramsey, C. 2019. An archaeological radiocarbon database for southern Africa. *Antiquity* 93: 870–885.

Lombard, M. 2021. Variation in hunting weaponry for more than 300,000 years: a tip cross-sectional area study of Middle Stone Age points from southern Africa. *Quaternary Science Reviews* 264: 107021.

Lombard, M., Högberg, A. & Wadley, L. 2019. Temporal perspectives on Still Bay point production at Sibudu Cave, KwaZulu-Natal, in the context of southern Africa. *Azania: Archaeological Research in Africa* 54(2): 141–176.

Lombard, M., Wadley, L.Y.N., Deacon, J., Wurz, S., Parsons, I., Mohapi, M., Swart, J. & Mitchell, P. 2012. South African and Lesotho stone Age sequence updated (I). *South African Archaeological Bulletin* 67(195): 123–144.

Lombard, M., Wadley, L., Jacobs, Z., Mohapi, M. & Roberts, R.G. 2010. Still Bay and serrated points from Umhlatuzana Rock Shelter, KwaZulu-Natal, South Africa. *Journal of Archaeological Science* 37: 1773–1784.

Lotter, M.G. 2020. A preliminary assessment of large cutting tool production at the Acheulean site of Penhill farm, lower Sundays River valley, Eastern Cape Province, South Africa. *South African Archaeological Bulletin* 75: 58–69.

Lotter, M.G., Caruana, M.V. & Lombard, M. 2021. The large cutting tools from Wonderboom, South Africa. *Lithic Technology* 47(2): 1–16.

Lotter, M.G. & Kuman, K. 2018a. Atmar and Bernol farms: new Acheulean sites in the lower Sundays River Valley, Eastern Capeprovince, South Africa. *South African Archaeological Bulletin* 73: 64–74.

Lotter, M.G. & Kuman, K. 2018b. The Acheulean in South Africa, with announcement of a new site (Penhill Farm) in the lower Sundays River Valley, Eastern Cape Province, South Africa. *Quaternary International* 480: 43–65.

Low, M. 2019. Continuity, variability and the nature of technological change during the Late Pleistocene at Klipfonteinrand Rockshelter in the Western Cape, South Africa. *African Archaeological Review* 36: 67–88.

Low, M. & Mackay, A. 2016. The Late Pleistocene microlithic at Putslaagte 8 rockshelter in the Western Cape, South Africa. *South African Archaeological Bulletin* 71: 146–159.

Low, M. & Mackay, A. 2018. The organisation of Late Pleistocene Robberg blade technology in the Doring River catchment, South Africa. *Journal of African Archaeology* 16: 168–192.

Low, M. & Pargeter, J. 2020. Regional variability in lithic miniaturization and the organization of technology in Late Glacial southern Africa (~18–11 kcal BP). *Journal of African Archaeology*, 18: 38–66.

Lukich, V., Porat, N., Faershtein, G., Cowling, S. & Chazan, M. 2019. New chronology and stratigraphy for Kathu Pan 6, South Africa. *Journal of Paleolithic Archaeology* 2(3): 235–257.

Mackay, A. 2010. The late Pleistocene archaeology of Klein Kliphuis Rock Shelter, Western Cape: 2006 excavations. *South African Archaeological Bulletin* 65: 132–147.

Mackay, A., Jacobs, Z. & Steele, T.E. 2015. Pleistocene archaeology and chronology of Putslaagte 8 (PL8) rockshelter, Western Cape, South Africa. *Journal of African Archaeology* 13(1): 71–98.

Mackay, A., Sumner, A., Jacobs, Z., Marwick, B., Bluff, K. & Shaw, M. 2014. Putslaagte 1 (PL1), the Doring River, and the later Middle Stone Age in southern Africa's winter rainfall zone. *Quaternary International* 350: 43–58.

Maggs, T. 1977. Some recent radiocarbon dates from eastern and southern Africa. *Journal of African History* 18: 161–191.

Maggs, T. & Ward, V. 1980. Driel Shelter: rescue at a Late Stone Age site on the Tugela River. *Annals of the Natal Museum* 24: 35–70.

Makhubela, T.V. & Kramers, J.D. 2022. Testing a new combined (U, Th)–He and U/Th dating approach on Plio-Pleistocene calcite speleothems. *Quaternary Geochronology* 67: 101234.

Makhubela, T.V., Kramers, J.D., Scherler, D., Wittmann H., Dirks, P.H.G.M. & Winkler, S.R. 2019. Effects of long soil surface residence times on apparent cosmogenic nuclide denudation rates and burial ages in the Cradle of Humankind, South Africa. *Earth Surface Processes and Landforms* 44: 2968–2981.

Manhire, A. 1993. A report on the excavations at the Faraoskop rock shelter in the Graafwater district of the south-western Cape. *Southern African Field Archaeology* 2: 3–23.

Mark, D.F., Petraglia, M., Smith, V.C., Morgan, L.E., Barfod, D.N., Ellis, B.S., Pearce, N.J., Pal, J.N. & Korisettar, R. 2014. A high-precision $^{40}Ar/^{39}Ar$ age for the Young Toba Tuff and dating of ultra-distal tephra: forcing of Quaternary climate and implications for hominin occupation of India. *Quaternary Geochronology* 21: 90–103.

Marshall, L. 1976. *The !Kung of Nyae Nyae*. Cambridge, MA: Harvard University Press.

Mason, R.J. 1962. *Prehistory of the Transvaal*. Johannesburg: Witwatersrand University Press.

Mason, R.J. 1988. *Kruger Cave*, *Late Stone Age*, *Magaliesburg*. Johannesburg: Archaeological Research Unit, University of the Witwatersrand.

Mauran, G., Lebon, M., Lapauze, O., Nankela, A., Detroit, F., Lesur, J., Bahain, J-J. & Pleurdeau, D. 2020. Archaeological ochres of the rock art site of Leopard Cave (Erongo, Namibia): looking for Later Stone Age sociocultural behaviors. *African Archaeological Review* 37: 527–550.

Mazel, A.D. 1984a. Diamond 1 and Clarke's Shelter: report on excavations in the northern Drakensberg, Natal, South Africa. *Annals of the Natal Museum* 26: 25–70.

Mazel, A.D. 1984b. Gehle Shelter: report on excavations in the uplands ecological zone, Tugela Basin, Natal, South Africa. *Annals of the Natal Museum* 26: 1–24.

Mazel, A.D. 1986a. Mbabane Shelter and eSinhlonhlweni Shelter: the last two thousand years of hunter-gatherer settlement in the central Thukela Basin, Natal, South Africa. *Annals of the Natal Museum* 27: 389–453.

Mazel, A.D. 1986b. Mgede Shelter: a mid- and late Holocene observation in the western Biggarsberg, Thukela Basin, Natal, South Africa. *Annals of the Natal Museum* 27: 357–387.

Mazel, A.D. 1988. Nkupe Shelter: report on excavations in the eastern Biggarsberg, Thukela Basin, Natal, South Africa. *Annals of the Natal Museum* 29: 321–377.

Mazel, A.D. 1992. Collingham Shelter: the excavation of late Holocene deposits, Natal, South Africa. *Natal Museum Journal of Humanities* 4: 1–51.

Mazel, A.D. 1996. Maqonqo Shelter: the excavation of Holocene deposits in the eastern Biggarsberg, Thukela Basin, South Africa. *Natal Museum Journal of Humanities* 8: 1–39.

Mazel, A.D. 1997. Mzinyashana Shelters 1 and 2: excavation of mid and late Holocene deposits in the eastern Biggarsberg, Thukela Basin, South Africa. *Natal Museum Journal of Humanities* 9: 1–35.

Mazel, A.D. 1999. iNkolimahashi Shelter: the excavation of Later Stone Age rock shelter deposits in the central Thukela Basin, KwaZulu-Natal, South Africa. *Natal Museum Journal of Humanities* 11: 1–21.

McCall, G., Pearson, T., Tanner, T. & Taylor-Perryman, R. 2011. Erb Tanks: a Middle and Later Stone Age rockshelter in the Central Namib Desert, western Namibia. *PalaeoAnthropology* 2011: 398–421.

McCrossin, M. 1994. Human molars from later Pleistocene deposits of Witkrans Cave, Gaap Escarpment, Kalahari Margin. *Human Evolution* 7: 1–10.

McGrath, J., Cleghorn, N., Gennari, B., Henderson, S., Kyriacou, K., Nelson-Viljoen, C., Nilssen, P., Richardson, L., Shelton, C., Wilkins, J. & Marean, C. 2015. The Pinnacle Point Shell Midden Complex: a mid to late Holocene record of Later Stone Age coastal foraging along the Southern Cape coast of South Africa. *South African Archaeological Bulletin* 70: 209–219.

Menter, C.G., Kuykendall, K.L., Keyser, A.W. & Conroy, G.C. 1999. First record of hominid teeth from the Plio-Pleistocene site of Gondolin, South Africa. *Journal of Human Evolution* 37: 299–307.

Mercader, J., Asmerom, Y., Bennett, T., Raja, M. & Skinner, A. 2009. Initial excavation and dating of Ngalue Cave: a Middle Stone Age site along the Niassa rift, Mozambique. *Journal of Human Evolution* 57: 63–74.

Mercader, J., Gosse, J.C., Bennett, T., Hidy, A.J. & Rood, D.H. 2012. Cosmogenic nuclide age constraints on Middle Stone Age lithics from Niassa, Mozambique. *Quaternary Science Reviews* 47: 116–130.

Millard, A.R. 2008. A critique of the chronometric evidence for hominid fossils: I. Africa and the Near East 500–50 ka. *Journal of Human Evolution* 54(6): 848–874.

Miller, G.H., Beaumont, P.B., Deacon, H.J., Brooks, A.S., Hare, P.E. & Jull, A.J.T. 1999. Earliest modern humans in southern Africa dated by isoleucine epimerization in ostrich eggshell. *Quaternary Science Reviews* 18(13): 1537–1548.

Mitchell, P.J. 1993a. Archaeological investigations at two Lesotho rock-shelters: the terminal Pleistocene/early Holocene assemblages from Ha Makotoko and Ntloana Tsoana. *Proceedings of the Prehistoric Society* 59: 39–60.

Mitchell, P.J. 1993b. The archaeology of Tloutle rock-shelter, Maseru District, Lesotho. *Research Reports of the National Museum, Bloemfontein* 9: 77–132.

Mitchell, P.J. 1994. Understanding the MSA/LSA transition: the pre-20,000 BP assemblages from new excavations at Sehonghong Rock Shelter, Lesotho. *Southern African Field Archaeology* 3: 15–25.

Mitchell, P.J. 1995. Revisiting the Robberg: new results and a revision of old ideas at Sehonghong rock-shelter, Lesotho. *South African Archaeological Bulletin* 50: 28–38.

Mitchell, P.J. 1996a. Sehonghong: The Late Holocene assemblages with pottery. *South African Archaeological Bulletin* 51: 17–25.

Mitchell, P.J. 1996b. Filling the gap: the Early and Middle Holocene assemblages from new excavations at Sehonghong rock shelter, Lesotho. *Southern African Field Archaeology* 5: 17–27.

Mitchell, P.J. 2009. The flaked stone artefact assemblages from Likoaeng: a late Holocene sequence in highland Lesotho and its regional context. *Southern African Humanities* 21: 117–156.

Mitchell, P. 2010. Making history at Sehonghong: Soai and the last Bushman occupants of his shelter. *Southern African Humanities* 22(1): 149–170.

Mitchell, P.J. & Arthur, C. 2010. Archaeological fieldwork in the Metolong Dam Catchment, Lesotho, 2008–10. *Nyame Akuma*: 51–62.

Mitchell, P.J. & Arthur, C. 2014. Ha Makotoko: Later Stone Age Occupation across the Pleistocene/Holocene Transition in western Lesotho. *Journal of African Archaeology* 12: 205–232.

Mitchell, P.J. & Steinberg, J.M. 1992. Ntloana Tsoana: a Middle Stone Age sequence from western Lesotho. *South African Archaeological Bulletin* 47: 26–33.

Mitchell, P.J., Yates, R. & Parkington, J.E. 1996. At the transition: the archaeology of the Pleistocene–Holocene boundary in southern Africa. In: Straus, L.G., Eriksen, B.V., Erlandson, J.M. & Yesner, D.R. (eds) *Humans at the End of the Ice Age: the Archaeology of the Pleistocene–Holocene Transition*: 15–41. London: Plenum Press.

Mitchell, P.J., Plug, I., Bailey, G.N. & Woodborne, S. 2008. Bringing the Kalahari debate to the mountains: late first millennium AD hunter-gatherer/farmer interaction in highland Lesotho. *Before Farming* 2008/2: article 4.

Mitchell, P.J., Plug, I., Bailey, G.N., Charles, R.L.C., Esterhuysen, A.B., Lee Thorp, J.A., Parker, A.G. & Woodborne, S. 2011. Beyond the drip line: a high-resolution open-air Holocene hunter-gatherer sequence from highland Lesotho. *Antiquity* 85: 1225–1242.

Moggi-Cecchi, J., Menter, C., Boccone, S. & Keyser, A. 2010. Early hominin dental remains from the Plio-Pleistocene site of Drimolen, South Africa. *Journal of Human Evolution* 58: 374–405.

Morris, A. G. 1992. *A Master Catalogue: Holocene Human Skeletons from South Africa*. Johannesburg: Witwatersrand University Press.

Morrissey, P., Knight, J. & Stratford, D.J. 2020. Early Marine Isotope Stage 5 sea levels, coastal dune palaeoenvironments, and human occupation on the southeast coast of South Africa. *Quaternary Science Reviews* 245: 106504.

Nami, H.G., De la Peña, P., Vásquez, C.A., Feathers, J. & Wurz, S. 2016. Palaeomagnetic results and new dates of sedimentary deposits from Klasies River Cave 1, South Africa. *South African Journal of Science* 112(11–12): 1–12.

Nicoll, K. 2010. Geomorphic development and Middle Stone Age archaeology of the Lower Cunene River, Namibia–Angola border. *Quaternary Science Reviews* 29(11–12): 1419–1431.

Niekus, M.J.L.T., Kozowyk, P.R.B., Langejans, G.H.J., Ngan-Tillard, D., Van Keulen, H., Van der Plicht, J., Cohen, K.M., Van Wingerden, W., Van Os, B., Smit, B.I., Amkreutz, L.W.S.W., Johansen, L., Verbaas, A. & Dusseldorp, G.L. 2019. Middle paleolithic complex technology and a Neandertal tar-backed tool from the Dutch North Sea. *Proceedings of the National Academy of Sciences* 116: 22081–22087.

Ogola, C. 2009. The Sterkfontein Western breccias: stratigraphy, fauna and artefacts. Unpublished PhD thesis. Johannesburg: University of the Witwatersrand.

Opperman, H. 1978. Excavations in the Buffelskloof rock shelter near Calitzdorp, southern Cape. *South African Archaeological Bulletin* 33: 18–38.

Opperman, H. 1987. *The Later Stone Age of the Drakensberg Range and its Foothills*. Oxford: British Archaeological Reports.

Opperman, H. 1988. A report on excavations at Grassridge Rockshelter, Sterkstroom District, Cape Province. *Fort Hare Papers* 7: 391–406.

Opperman, H. 1996. Strathalan B, north-eastern Cape Province, South Africa: evidence for human behaviour 29,000–26,000 years ago. *Quaternary International* 33: 45–53.

Opperman, H. & Heydenrych, B. 1990. A 22 000-year-old Middle Stone Age camp site with plant food remains from the north-eastern Cape. *South African Archaeological Bulletin* 45: 93–99.

Orton, J. 2004. The quartz conundrum: understanding the role of quartz in the composition of late Pleistocene and Holocene lithic assemblages from the Verlorenvlei area, Western Cape. Unpublished MA dissertation. Cape Town: University of Cape Town.

Orton, J. 2014. SALSA: The Holocene technocomplexes, a reply to Lombard and colleagues. *South African Archaeological Bulletin*, 69(199): 110–112.

Orton, J. 2018. VR048: An open-air later Stone Age site on the Knersvlakte of southern Namaqualand. *South African Archaeological Bulletin* 73: 126–137.

Orton, J. 2020. Digging deeper into the Elands Bay mid-Holocene 'hiatus': further evidence from Dunefield Midden 1, Western Cape, South Africa. *South African Archaeological Bulletin* 75: 70–74.

Orton, J. & Halkett, D. 2010. Stone tools, beads and a river: two Holocene microlithic sites at Jakkalsberg in the north-western Richtersveld, Northern Cape, South Africa. *South African Archaeological Bulletin* 65: 13–25.

Orton, J., Klein, R.G., Mackay, A., Schwortz, S. & Steele, T.E. 2011. Two Holocene rock shelter deposits from the Knersvlakte, southern Namaqualand, South Africa. *Southern African Humanities* 23: 109–150.

Orton, J. & Parsons, I. 2018. Looking beneath the surface: Later Stone Age remains at Klipgats Pan, Bushmanland, South Africa. *Southern African Humanities* 31: 181–204.

Ossendorf, G. 2013. *Spätpleistozäne Jager-Sammler des südwestlichen Namibias*. Unpublished PhD thesis. Köln: Universitat zu Köln.

Ossendorf, G. 2017a. Technological analyses of Late Pleistocene Later Stone Age lithic assemblages from Apollo 11 Rock Shelter, Karas region, southwestern Namibia. *South African Archaeological Bulletin* 72(205): 17–37.

Ossendorf, G. 2017b. Two Holocene Later Stone Age stratigraphies from the Sesfontein area, northwestern Namibia. *Azania: Archaeological Research in Africa* 52: 233–266.

Pargeter, J., Loftus, E., Mackay, A., Mitchell, P. & Stewart, B. 2018. New ages from Boomplaas Cave, South Africa, provide increased resolution on late/terminal Pleistocene human behavioural variability. *Azania: Archaeological Research in Africa* 53: 156–184.

Pargeter, J., Loftus, E. & Mitchell, P. 2017. New ages from Sehonghong rock shelter: implications for the late Pleistocene occupation of highland Lesotho. *Journal of Archaeological Science: Reports* 12: 307–315.

Parkington, J. 1992. Making sense of sequence at the Elands Bay Cave, western Cape, South Africa. In: Smith, A.B. & Mütti, B. (eds) *Guide to Archaeological Sites in the Western Cape*: 6–12. Cape Town: University of Cape Town.

Parkington, J. 2012. Mussels and mongongo nuts: logistical visits to the Cape west coast, South Africa. *Journal of Archaeological Science* 39(5): 1521–1530.

Parkington, J. 2013. Rounded but not reworked? Spatial patterning in the stone tool assemblage from Dunefield Midden. *South African Archaeological Bulletin* 68: 211–216.

Parsons, I. 2008. Five Later Stone Age artefact assemblages from the interior Northern Cape Province. *South African Archaeological Bulletin* 63: 51–60.

Pazan, K.R., Dewar, G. & Stewart, B.A. 2022. The MIS5a (~ 80 ka) Middle Stone Age lithic assemblages from Melikane Rockshelter, Lesotho: highland adaptation and social fragmentation. *Quaternary International* 611: 119–137.

Pickering, R. 2015. U–Pb dating small buried stalagmites from Wonderwerk Cave, South Africa: a new chronometer for earlier stone age cave deposits. *African Archaeological Review* 32: 645–668.

Pickering, R. & Edwards, T.R. 2021. Factors controlling age quality in U–Pb dated Plio-Pleistocene speleothems from South Africa: the good, the bad and the ugly. *Chemical Geology* 579: 120364.

Pickering, T.R., Heaton, J.L., Clarke, R.J., Sutton, M.B., Brain, C.K. & Kuman, K. 2012. New hominid fossils from Member 1 of the Swartkrans formation, South Africa. *Journal of Human Evolution* 62: 618–628.

Pickering, R., Herries, A.I.R., Woodhead, J.D., Hellstrom, J.C., Green, H.E., Paul, B., Ritzman, T., Strait, D.S., Schoville, B.J. & Hancox, P.J. 2019. U–Pb-dated flowstones restrict South African early hominin record to dry climate phases. *Nature* 565: 226–229.

Pickering, R., Jacobs, Z., Herries, A.I.R., Karkanas, P., Bar-Matthews, M., Woodhead, J.D., Kappen, P., Fisher, E. & Marean, C.W. 2013. Paleoanthropologically significant South African sea caves dated to 1.1-1.0 million years using a combination of U–Pb, TT-OSL and palaeomagnetism. *Quaternary Science Reviews* 65: 39–52.

Pickering, R., Kramers, J.D., Hancox, P.J., de Ruiter, D.J. & Woodhead, J.D. 2011. Contemporary flowstone development links early hominin bearing cave deposits in South Africa. *Earth and Planetary Science Letters* 306: 23–32.

Pickering, R., Kramers, J.D., Partridge, T.C., Kodolanyi, J. & Pettke, Th. 2010. U–Pb dating of calcite-aragonite layers in speleothems from hominid sites in South Africa by MC-ICP-MS. *Quaternary Geochronology* 5: 544–558.

Pienaar, M., Woodborne, S. & Wadley, L. 2008. Optically stimulated luminescence dating at Rose Cottage Cave. *South African Journal of Science* 104: 65–70.

Pike, A. W. G., Eggins, S., Grün, R. & Thackeray, F. 2004. U-series dating of TP1, an almost complete human skeleton from Tuinplaas (Springbok Flats), South Africa. *South African Journal of Science* 100: 381–383.

Pinto, H., Archer, W., Witelson, D., Regensberg, R., Baker, S., Mokhachane, R., Ralimpe, J., Ndaba, N., Mokhantso, L., Lecheko, P. & Challis, S. 2018. The Matatiele Archaeology and Rock Art (MARA) Program Excavations: the archaeology of Mafusing 1 Rock Shelter, Eastern Cape, South Africa. *Journal of African Archaeology* 16: 145–167.

Plug, I. & Mitchell, P. 2008. Sehonghong: hunter-gatherer utilization of animal resources in the highlands of Lesotho. *Annals of the Transvaal Museum* 45: 31–53.

Plug, I., Mitchell, P.J. & Bailey, G.N. 2010. Late Holocene fishing strategies in southern Africa as seen from Likoaeng, highland Lesotho. *Journal of Archaeological Science* 37: 3111–3123.

Porat, N., Chazan, M., Grün, R., Aubert, M., Eisenmann, V. & Horwitz, L.K. 2010. New radiometric ages for the Fauresmith industry from Kathu Pan, southern Africa: implications for the Earlier to Middle Stone Age transition. *Journal of Archaeological Science* 37: 269–283.

Porraz, G., Igreja, M., Schmidt, P. & Parkington, J.E. 2016. A shape to the microlithic Robberg from Elands Bay Cave (South Africa). *Southern African Humanities* 29(1): 203–247.

Porraz, G., Texier, P-J., Archer, W., Piboule, M., Rigaud, J-P. & Tribolo, C. 2013. Technological successions in the Middle Stone Age sequence of Diepkloof Rock Shelter, Western Cape, South Africa. *Journal of Archaeological Science* 40: 3376–3400.

Porraz, G. & Val, A. 2019. Heuningneskrans and the Stone Age sequence of the Ohrigstad river catchment on the eastern border of the great escarpment, Limpopo Province, South Africa. *South African Archaeological Bulletin* 74(209): 46–55.

Porraz, G., Val, A., Tribolo, C., Mercier, N., De la Peña, P., Haaland, M.M., Igreja, M., Miller, C.E. & Schmid, V.C. 2018. The MIS5 Pietersburg at '28'Bushman Rock Shelter, Limpopo Province, South Africa. *PLOS ONE* 13(10): e0202853.

Price-Williams, D. 1981. A preliminary report on recent excavations of Middle and Late Stone Age levels at Sibebe Shelter, north-west Swaziland. *South African Archaeological Bulletin* 36: 22–28.

Protsch, R. & Oberholzer, J.J. 1975. Palaeoanthropology, chronology, and archeology of the Matjes River Rock Shelter. *Zeitschrift für Morphologie und Anthropologie* 67: 32–43.

Puech, E., Bamford, M., Porraz, G., Val, A. & Théry-Parisot, I. 2021. Evaluating sampling methods in charcoal-rich layers and high diversity environment: a case study from the Later Stone Age of Bushman rock shelter, South Africa. *Quaternary International* 593–594: 36–49.

Reidsma, F.H., Sifogeorgaki, I., Dinckal, A., Huisman, H., Sier, M.J., Van Os, B. & Dusseldorp, G.L. 2021. Making the invisible stratigraphy visible: a grid-based, multi-proxy geoarchaeological study of Umhlatuzana Rockshelter, South Africa. *Frontiers in Earth Science* 9: 64105.

Reynolds, S.C., Clarke, R.J. & Kuman, K.A. 2007. The view from the Lincoln Cave: Mid- to Late Pleistocene fossil deposits from Sterkfontein hominid site, South Africa. *Journal of Human Evolution* 53: 260–271.

Richard, M., Chazan, M. & Porat, N. 2020. Single grain TT-OSL ages for the Earlier Stone Age site of Bestwood 1 (Northern Cape Province, South Africa). *Quaternary International* 614: 16–22.

Riga, A., Oxilia, G., Panetta, D., Salvadori, P., Benazzi, S., Wadley, L. & Moggi-Cecchi, J. 2018. Human deciduous teeth from the Middle Stone Age layers of Sibudu Cave (South Africa). *Journal of Anthropological Sciences* 96: 75–87.

Robb, A., Macamo, S., Guissamulo, A. & Lane, P. 2021. Observations from some newly recognised coastal shell middens at Praia De Chizavane, Gaza Province, Mozambique. *South African Archaeological Bulletin* 76: 163–170.

Robbins, L., Brook, G., Murphy, M., Campbell, A., Mclear, N. & Downey, W. 2000. Late quaternary archaeological and palaeoenvironmental data from sediments at Rhino Cave, Tsodilo Hills, Botswana. *Southern African Field Archaeology* 9: 17–31.

Robbins, L.H. & Campbell, A.C. 1989. The depression rock shelter site, Tsodilo Hills. *Botswana Notes Records* 20: 1–3.

Robbins, L.H., Campbell, A.C., Murphy, M.L., Brook, G., Liang, F., Skaggs, S., Srivastava, P., Mabuse, A. & Badenhorst, S. 2008. Recent archaeological research at Toteng, Botswana: early domesticated livestock in the Kalahari. *Journal of African Archaeology* 6(1): 131–149.

Robbins, J.L., Dirks, P.H.G.M., Roberts, E.M., Kramers, J.D., Makhubela, T.V., Hilbert-Wolf, H.L., Elliott, M., Wiersma, J.P., Placzek, C.J., Evans, M. & Berger, L.R. 2021. Providing context to the *Homo naledi* fossils: constraints from flowstones on the age of sediment deposits in Rising Star Cave, South Africa. *Chemical Geology* 567: 120108.

Robbins, L.H., Murphy, M.L., Brook, G.A., Ivester, A.I., Campbell, A., Klein, R., Milo, R., Stewart, M., Downey, W. & Stevens, N. 2000. Archaeology, palaeoenvironment, and chronology of the Tsodilo Hills White Paintings Rock Shelter, north-west Kalahari Desert, Botswana. *Journal of Archaeological Science* 27: 1085–1113.

Robbins, L., Murphy, M., Stevens, N. & Winkler, A. 1996. Paleoenvironment and archaeology of Drotsky's Cave: western Kalahari Desert, Botswana. *Journal of Archaeological Science* 23(1): 7–22.

Robinson, J.R. & Wadley, L. 2018. Stable isotope evidence for (mostly) stable local environments during the South African Middle Stone Age from Sibudu, KwaZulu-Natal. *Journal of Archaeological Science* 100: 32–44.

Ryano, K., Wurz, S., Van Niekerk, K. & Henshilwood, C. 2017. The technology of the early Oakhurst lithic technocomplex from Klipdrift Cave, southern Cape, South Africa. *African Archaeological Review* 34: 93–119.

Sadr, K. 2004. Feasting on Kasteelberg? Early herders on the west coast of South Africa. *Before Farming* 2004/3: article 2.

Sadr, K. 2015. Livestock first reached southern Africa in two separate events. *PLOS ONE* 10(8): 0134215.

Sadr, K. & Sampson, C.G. 2006. Through thick and thin: early pottery in southern Africa. *Journal of African Archaeology* 4: 235–252.

Sadr, K., Smith, A., Plug, I., Orton, J. & Mütti, B. 2003. Herders and foragers on Kasteelberg: interim report of excavations 1999–2002. *South African Archaeological Bulletin* 58: 27–32.

Sampson, C.G. 1974. *The Stone Age Archaeology of Southern Africa*. New York: Academic Press.

Schaen, A.J., Jicha, B.R., Hodges, K.V., Vermeesch, P., Stelten, M.E., Mercer, C.M., Phillips, D., Rivera, T.A., Jourdan, F., Matchan, E.L., Hemming, S.R., Morgan, L.E., Kelley, S.P., Cassata, W.S., Heizler, M.T., Vasconcelos, P.M., Benowitz, J.A., Koppers, A.A.P., Mark, D.F., Niespolo, E.M., Sprain, C.J., Hames, W.E., Kuiper, K.F., Turrin, B.D., Renne, P.R., Ross, J., Nomade, S., Guillou, H., Webb, L.E., Cohen, B.A., Calvert, A.T., Joyce, N., Ganer d, M., Wijbrans, J., Ishizuka, O., He, H., Ramirez, A., Pfänder, J.A., Lopez-Martínez, M., Qiu, H. & Singer, B.S. 2021. Interpreting and reporting $^{40}Ar/^{39}Ar$ geochronologic data. *GSA Bulletin* 133: 461–487.

Schmid, P. & Berger, L.R. 1997. Middle Pleistocene hominid carpal proximal phalanx from the Gladysvale site, South Africa. *South African Journal of Science* 93: 430–431.

Schmidt, P., Stynder, D., Conard, N.J. & Parkington, J.E. 2020. When was silcrete heat treatment invented in South Africa? *Palgrave Communications* 6(1): 1–10.

Schrire, C. 1962. Oakhurst: a re-examination and vindication. *South-African Archaeological Bulletin* 17: 181–195.

Schwarcz, H.P. & Rink, W.J. 2000. ESR dating of the Die Kelders Cave 1 site, South Africa. *Journal of Human Evolution* 38(1): 121–128.

Schweitzer, F.R. 1979. Excavations at Die Kelders, Cape Province, South Africa: the Holocene deposits. *Annals of the South African Museum* 78: 101–233.

Schweitzer, F.R. & Wilson M.L. 1982. Byneskranskop 1: a late Quaternary living site in the southern Cape Province, South Africa. *Annals of the South African Museum* 88: 1–203.

Scott, L. 1987. Pollen analysis of hyena coprolites and sediments from Equus Cave, Taung, southern Kalahari (South Africa). *Quaternary Research* 28: 144-156.

Scott, L., Sobol, M., Neumann, F.H., Gil Romera, G., Fernández-Jalvo, Y., Bousman, C.B., Horwitz, L.K. & Van Aardt, A.C. 2022. Late Quaternary palaeoenvironments in the central semi-arid region of South Africa from pollen in cave, pan, spring, stream and dung deposits. *Quaternary International* 614: 84–97.

Sealy, J. & Yates, R. 1994. The chronology of the introduction of pastoralism to the Cape, South Africa. *Antiquity* 68: 58–67.

Sealy, J.C., Patrick, M.K., Morris, A.G. & Alder, D. 1992. Diet and dental caries among Later Stone Age inhabitants of the Cape Province, South Africa. *American Journal of Physical Anthropology* 7: 123–134.

Sealy, J., Maggs, T., Jerardino, A. & Kaplan, J. 2004. Excavations at Melkbosstrand: variability among herder sites on Table Bay, South Africa. *South African Archaeological Bulletin* 59: 17–28.

Sealy, J., Ludwig, B. & Henderson, Z. 2006. New radiocarbon dates for Matjes River rock shelter. *South African Archaeological Bulletin* 61: 98–101.

Shaar, R., Matmon, A., Horwitz, L.K., Ebert, Y., Chazan, M., Arnold, M., Aumaître, G., Bourlès, D. & Keddadouche, K. 2021. Magnetostratigraphy and cosmogenic dating of Wonderwerk Cave: new constraints for the chronology of the South African Earlier Stone Age. *Quaternary Science Reviews* 259: 106907.

Shea, J.J. 2014. Sink the Mousterian? Named stone tool industries (NASTIES) as obstacles to investigating hominin evolutionary relationships in the Later Middle Paleolithic Levant. *Quaternary International* 350: 169–179.

Shipton, C., Blinkhorn, J., Archer, W., Kourampas, N., Roberts, P., Prendergast, M.E., Curtis, R., Herries, A.I.R., Ndiema, E., Boivin, N. & Petraglia, M.D. 2021. The Middle to Later Stone Age transition at Panga ya Saidi, in the tropical coastal forest of eastern Africa. *Journal of Human Evolution* 153: 102954.

Sifogeorgaki, I., Klinkenberg, V., Esteban, I., Murungi, M.L., Carr, A.S., Van den Brink, V.B. & Dusseldorp, G.L. 2020. New excavations at Umhlatuzana rockshelter KwaZulu-Natal, South Africa: a stratigraphical and taphonomical evaluation. *African Archaeological Review* 37.

Smith, A.B. 1987. Seasonal exploitation of resources on the Vredenburg Peninsula after 2000 B.P. In: Parkington, J. & Hall, M. (eds) *Papers in the Prehistory of the Western Cape*: 393–402. Oxford: British Archaeological Reports International Series 207.

Smith, A.B., Sadr, K., Gribble, J. & Yates, R. 1991. Excavations in the south-western Cape, South Africa, and the archaeological identity of prehistoric hunter-gatherers within the last 2000 years. *South African Archaeological Bulletin* 46: 71–91.

Smith, A.B., Halkett, D., Hart, T. & Mütti, B. 2001. Spatial patterning, cultural identity and site integrity on open sites: evidence from Bloeddrift 23, a pre-colonial herder camp in the Richtersveld, Northern Cape Province, South Africa. *South African Archaeological Bulletin* 56: 23-33.

Smith, E.I., Jacobs, Z., Johnsen, R., Ren, M., Fisher, E.C., Oestmo, S., Wilkins, J., Harris, J.A., Karkanas, P., Fitch, S. & Ciravolo, A. 2018. Humans thrived in South Africa through the Toba eruption about 74,000 years ago. *Nature* 555(7697): 511–515.

Smith, E., Johnsen, R., Hirniak, J., Ren, M., Marean, C., Fisher, E., Mentzer, S., Wurz, S., Porraz, G., Cleghorn, N., Keenan, D. & Fitch, S. 2019. Cryptotephra studies in Africa: a tool for precise dating and continental correlation of archaeological sites. Society for American Archaeology, 84th annual meeting, 10–14 April, Albuquerque.

Soper, R.C. 1974. New radiocarbon dates for eastern and southern Africa. *Journal of African History* 15: 175–192.

Soriano, S., Villa, P., Delagnes, A., Degano, I., Pollarolo, L., Lucejko, J.J., Henshilwood, C. & Wadley, L. 2015. The Still Bay and Howiesons Poort at Sibudu and Blombos: understanding Middle Stone Age technologies. *PLOS ONE* 10: e0131127.

Steele, T.E., Mackay, A., Fitzsimmons, K.E., Igreja, M., Marwick, B., Orton, J., Schwortz, S. & Stahlschmidt, M.C. 2016. Varsche Rivier 003: a Middle and Later Stone Age site with Still Bay and Howiesons Poort assemblages in southern Namaqualand, South Africa. *PaleoAnthropology* 2016: 100–163.

Stewart, B.A., Dewar, G.I., Morley, M.W., Inglis, R.H., Wheeler, M., Jacobs, Z. & Roberts, R.G. 2012. Afromontane foragers of the Late Pleistocene: site formation, chronology and occupational pulsing at Melikane Rockshelter, Lesotho. *Quaternary International* 270: 40–60.

Stratford, D., Granger, D.E., Bruxelles, L., Clarke, R.J., Kuman, K. & Gibbon, R.J. 2017. Comments on 'The age of fossil StW573 ('Little Foot'): an alternative interpretation of $^{26}Al/^{10}Be$ burial data'. *South African Journal of Science* 113: 3.

Stynder, D.D., Ackermann, R.R. & Sealy, J.C. 2007. Early to mid-Holocene South African Later Stone Age human crania exhibit a distinctly Khoesan morphological pattern. *South African Journal of Science* 103: 349–352.

Susman, R.L. 1989. New hominid fossils from the Swartkrans formation (1979–1986 excavations): postcranial specimens. *American Journal of Physical Anthropology* 79: 451–474.

Susman, R.L., De Ruiter, D. & Brain, C.K. 2001. Recently identified postcranial remains of *Paranthropus* and early *Homo* from Swartkrans Cave, South Africa. *Journal of Human Evolution* 41(6): 607–629.

Sutton, M.B., Pickering, T.R., Pickering, R., Brain, C.K., Clarke, R.J., Heaton, J.L. & Kuman, K. 2009. Newly discovered fossil-and artifact-bearing deposits, uranium-series ages, and Plio-Pleistocene hominids at Swartkrans Cave, South Africa. *Journal of Human Evolution* 57(6): 688–696.

Sutton, M.B., Kuman, K. & Steininger, C. 2017. Early Pleistocene stone artefacts from Cooper's Cave, South Africa. *South African Archaeological Bulletin* 72: 156–161.

Szabo, B.J. & Butzer, K.W. 1979. Uranium-series dating of lacustrine limestones from pan deposits with final Acheulian assemblages at Rooidam, Kimberley District, South Africa. *Quaternary Research* 11: 257–260.

Thackeray, A.I. 2000. Middle Stone Age artefacts from the 1993 and 1995 excavations of Die Kelders Cave 1, South Africa. *Journal of Human Evolution* 38(1): 147–168.

Thackeray, A.I., Thackeray, J.F. & Beaumont, P.B. 1983. Excavations at the Blinkklipkop specularite mine near Postmasburg, northern Cape. *South African Archaeological Bulletin* 38: 17–25.

Thorp, C.R. 1996. A preliminary report on evidence of interaction between hunter-gatherers and farmers along a hypothesised frontier in the eastern Free State. *South African Archaeological Bulletin* 51: 57–63.

Thorp, C.R. 1997. Evidence for interaction from recent hunter-gatherer sites in the Caledon Valley. *African Archaeological Review* 14: 231–256.

Tobias, P.V. 1971. Human skeletal remains from the Cave of Hearths, Makapansgat, Northern Transvaal. *American Journal of Physical Anthropology* 34: 335–367.

Tribolo, C., Mercier, N., Selo, M., Valladas, H., Joron, J.L., Reyss, J.L., Henshilwood, C., Sealy, J. & Yates, R. 2006. TL dating of burnt lithics from Blombos Cave (South Africa): further evidence for the antiquity of modern human behaviour. *Archaeometry* 48(2): 341–357.

Tribolo, C., Mercier, N., Douville, E., Joron, J.L., Reyss, J.L., Rufer, D., Cantin, N., Lefrais, Y., Miller, C.E., Porraz, G. & Parkington, J. 2013. OSL and TL dating of the Middle Stone Age sequence at Diepkloof Rock Shelter (South Africa): a clarification. *Journal of Archaeological Science* 40(9): 3401–3411.

Tribolo, C., Mercier, N., Lefrais, Y., Miller, C.E., Parkington, J., Valladas, H. & Porraz, G. 2016. Chronology of the Pleistocene deposits at Elands Bay Cave (South Africa) based on charcoals, burnt lithics, and sedimentary quartz and feldspar grains. *Southern African Humanities* 29(1): 129–152.

Tribolo, C., Mercier, N., Martin, L., Taffin, N., Miller, C.E., Will, M. & Conard, N. 2022. Luminescence dating estimates for the coastal MSA sequence of Hoedjiespunt 1 (South Africa). *Journal of Archaeological Science: Reports* 41: 103320.

Tryon, C.A. 2019. The Middle/Later Stone Age transition and cultural dynamics of late Pleistocene East Africa. *Evolutionary Anthropology: Issues, News, and Reviews* 28: 267–282.

Val, A., De la Peña, P., Duval, M., Bansal, S., Colino, F., Culey, J., Hodgskiss, T., Morrissey, P., Murray, A., Murungi, M., Neumann, F.H., Shadrach, K., Thomsen, K.J., Van der Ryst, M., Witelson, D.M., Zhao, J.X. & Stratford, D. 2021. The place beyond the trees: renewed excavations of the Middle Stone Age deposits at Olieboomspoort in the Waterberg Mountains of the South African Savanna Biome. *Archaeological and Anthropological Sciences* 13: 116.

Valladas, H., Wadley, L., Mercier, N., Tribolo, C., Reyss, J.L. & Joron, J.L.

2005. Thermoluminescence dating on burnt lithics from Middle Stone Age layers at Rose Cottage Cave. *South African Journal of Science* 101: 169–174.
Van Couvering, J.A. & Delson, E. 2021. African land mammal ages. *Journal of Vertebrate Paleontology* 40(5): e1803340.
Van der Ryst, M.M. 1998. *The Waterberg Plateau in the Northern Province, Republic of South Africa, in the Later Stone Age*. Oxford: British Archaeological Reports International Series 715.
Van Doornum, B. 2007. Tshisiku Shelter and the Shashe-Limpopo confluence area hunter-gatherer sequence. *Southern African Humanities* 19: 17–67.
Veldman, A., Parsons, I. & Lombard, M. 2017. Kuidas Spring 1, Namibia: first impressions of a Later Stone Age site complex. *South African Archaeological Bulletin* 72: 60–70.
Verna, C., Texier, P-J., Rigaud, J-P., Poggenpoel, C. & Parkington, J. 2013. The Middle Stone Age human remains from Diepkloof Rock Shelter (Western Cape, South Africa). *Journal of Archaeological Science* 40: 3532–3541.
Vinnicombe, P. 2009. Basotho oral traditions: the last Bushman inhabitants of the Mashai district, Lesotho. In: Mitchell, P.J. & Smith, B.W. (eds) *The Eland's People: New Perspectives in the Rock Art of the Maloti-Drakensberg Bushmen. Essays in Memory of Pat Vinnicombe*: 182–190. Johannesburg: Witwatersrand University Press.
Vogel, J.C. 1970. Groningen Radiocarbon Dates IX. *Radiocarbon* 12: 444–471.
Vogel, J.C. 2001. Radiometric dates for the Middle Stone Age in South Africa. In: Tobias, P.V., Raath, M.A., Maggi-Cecchi, J. & Doyle, G.A. (eds) *Humanity from African Naissance to Coming Millennia: Colloquia in Human Biology and Palaeoanthropology*: 261–268. Florence: Florence University Press.
Vogel, J.C., Fuls, A. & Visser, E. 1986. Pretoria radiocarbon dates III. *Radiocarbon* 28: 1133–1172.
Vogel, J.C. & Marais, M. 1971. Pretoria radiocarbon dates I. *Radiocarbon* 13: 378–374.
Vogel, J.C. & Visser, E. 1981. Pretoria radiocarbon dates II. *Radiocarbon* 23: 43–80.
Vogelsang, R. & Eichhorn, B. 2011. *Under the Mopane Tree: Holocene Settlement in Northern Namibia*. Köln: Heinrich-Barth Institute.
Vogelsang, R., Richer, J., Jacobs, Z., Eichhorn, B., Linseele, V. & Roberts, R. 2010. New excavations of Middle Stone Age Deposits at Apollo 11 Rockshelter, Namibia. *Journal of African Archaeology* 8: 185–218.
Wadley, L. 1987. *Later Stone Age Hunters and Gatherers of the Southern Transvaal: Social and Ecological Interpretations*. Oxford: British Archaeological Reports International Series 380.
Wadley, L. 1989. Legacies from the Later Stone Age. *South African Archaeological Society Goodwin Series* 6: 1–14.
Wadley, L. 1992. Rose Cottage Cave: the Later Stone Age levels with European and Iron Age artefacts. *South African Archaeological Bulletin* 47: 8–12.
Wadley, L. 1993. The Pleistocene Later Stone Age south of the Limpopo River. *Journal of World Prehistory* 7: 243–296.
Wadley, L. 1996a. Changes in the social relations of precolonial hunter-gatherers after agro-pastoralist contact: an example from the Magaliesberg, South Africa. *Journal of Anthropological Archaeology* 15: 205-217.
Wadley, L. 1996b. The Robberg Industry of Rose Cottage Cave, eastern Free State: the technology, spatial patterns and environment. *South African Archaeological Bulletin* 51: 64–74.
Wadley, L. 1997. Rose Cottage Cave: archaeological work 1987 to 1997. *South African Journal of Science* 93: 439–444.
Wadley, L. 2000a. The early Holocene layers of Rose Cottage Cave, eastern Free State: technology, spatial patterns and environment. *South African Archaeological Bulletin* 55: 18–31.
Wadley, L. 2000b. The Wilton and pre-ceramic post-classic Wilton Industries at Rose Cottage Cave and their context in the South African sequence. *South African Archaeological Bulletin* 55: 90–106.
Wadley, L. 2001. Who lived in Mauermanshoek Shelter, Korannaberg, South Africa? *African Archaeological Review* 18: 153–179.
Wadley, L. 2012. Revisiting Later Stone Age collections from Big Elephant Shelter, Namibia. *South African Archaeological Bulletin* 67: 101–107.
Wadley, L., Mauran, G., Sievers, C., Van Deventer, H., Biemond, W., Seanego, K., Li, B. & Jacobs, Z. 2021. Red Balloon Rock Shelter: Iron Age and Middle Stone Age occupations on the Waterberg Plateau in Limpopo, South Africa. *Southern African Humanities* 34: 19–58.
Wadley, L. & McClaren, G. 1998. Tandjesberg Shelter, eastern Free State, South Africa. *Natal Museum Journal of Humanities* 10: 19–32.
Wadley, L. & Mohapi, M. 2008. A segment is not a monolith: evidence from the Howiesons Poort of Sibudu, South Africa. *Journal of Archaeological Science* 35: 2594–2605.
Wadley, L. & Turner, G. 1987. Hope Hill Shelter: a Later Stone Age site in the southern Transvaal. *South African Journal of Science* 83: 98–105.
Wadley, L. & Vogel, J.C. 1991. New dates from Rose Cottage Cave. *South African Journal of Science* 87: 605–608.
Walker, J., Cliff Robert, A. & Latham Alfred, G. 2006. U–Pb isotopic age of the StW 573 hominid from Sterkfontein, South Africa. *Science* 314: 1592–1594.
Wallsmith, D. 1990. Driekoppen: a Middle Stone Age rockshelter. *Nyame Akuma* 33: 13–16.
Wang, Q., Tobias, P., Roberts, D. & Jacobs, Z. 2008. A re-examination of a human femur found at the Blind River Site, East London, South Africa: its age, morphology, and breakage pattern. *Anthropological Review* 71: 43–61.
Watson, S. Low, M., Phillips, N., O'Driscoll, V., Shaw, M., Ames, C., Jakobs, K. & Mackay, A. 2020. Robberg material procurement and transport in the Doring River Catchment: evidence from the open-air locality of Uitspankraal 9, Western Cape, South Africa. *Journal of African Archaeology* 18: 209–228.
Webley, L. 1992. Early evidence for sheep from Spoeg River Cave, Namaqualand. *Southern African Field Archaeology* 1: 3–13.
Webley, L. 1997. Jakkalsberg A and B: the cultural material from two pastoralist sites in the Richtersveld, Northern Cape. *Southern African Field Archaeology* 6: 3–19.
Webley, L. 2001. Excavations at /Hei-/khomas (Vaalhoek) in the Richtersveld, Northern Cape. *Southern African Field Archaeology* 10: 46–74.
Webley, L. 2002. The re-examination of Spoegrivier Cave on the west coast of South Africa. *Annals of the Eastern Cape Museums* 2: 19–49.
Webley, L. & Orton, J. 2013. Excavation of two shell middens at Port Nolloth on the Namaqualand coastline, Northern Cape, South Africa. *South African Archaeological Bulletin* 68: 86–92.
Wiessner, P.W. 1982. Risk, reciprocity and social influences on !Kung San economics. In: Leacock, E. & Lee, R.B. (eds) *Politics and History in Band Societies*: 61–84. Cambridge: Cambridge University Press.
Wilkins, J. 2020. Is it time to retire NASTIES in southern Africa? Moving beyond the culture-historical framework for Middle Stone Age lithic assemblage variability. *Lithic Technology* 45(4): 295–307.
Wilkins, J. 2021. *Homo sapiens* origins and evolution in the Kalahari Basin, southern Africa. *Evolutionary Anthropology: Issues, News, and Reviews* 30: 327–344.
Wilkins, J., Brown, K.S., Oestmo, S., Pereira, T., Ranhorn, K.L., Schoville, B.J. & Marean, C.W. 2017. Lithic technological responses to Late Pleistocene glacial cycling at Pinnacle Point Site 5–6, South Africa. *PLOS ONE* 12(3): e0174051.
Wilkins, J., Schoville, B.J., Brown, K.S., Gliganic, L., Meyer, M.C., Loftus, E., Pickering, R., Collins, B., Blackwood, A.F., Makalima, S. & Hatton, A. 2020. Fabric analysis and chronology at Ga-Mohana Hill North Rockshelter, southern Kalahari Basin: evidence for in situ, stratified Middle and Later Stone Age deposits. *Journal of Paleolithic Archaeology* 3(3): 336–361.
Will, M., El-Zaatari, S., Harvati, K. & Conard, N. J. 2019. Human teeth from securely stratified Middle Stone Age contexts at Sibudu, South Africa. *Archaeological and Anthropological Sciences* 11: 3491–3501.
Will, M. & Mackay, A. 2020. A matter of space and time: how frequent is convergence in lithic technology in the African archaeological record over the last 300 kyr? In: Groucutt, H.S. (ed.) *Culture History and Convergent Evolution: Can We Detect Populations in Prehistory?*: 103–125. Cham: Springer International Publishing.
Will, M., Parkington, J.E., Kandel, A.W. & Conard, N.J. 2013. Coastal adaptations and the Middle Stone Age lithic assemblages from Hoedjiespunt 1 in the Western Cape, South Africa. *Journal of Human Evolution* 64(6): 518–537.
Will, M. & Stock, J.T. 2015. Spatial and temporal variation of body size among early *Homo*. *Journal of Human Evolution* 82: 15–33.
Witelson, D. 2016. A preliminary description of lithic technology at Holkrans rock shelter, Vredefort Dome, South Africa. *South African Archaeological Bulletin* 71: 60–70.
Wood, B. (ed.) 2011. *Wiley-Blackwell Encyclopedia of Human Evolution*. Oxford: Wiley-Blackwell.
Wroth, K., Tribolo, C., Bousman, C.B., Horwitz, L.K., Rossouw, L., Miller, C.E. & Toffolo, M.B. 2022. Human occupation of the semi-arid grasslands of South Africa during MIS4: new archaeological and

paleoecological evidence from Lovedale, Free State. *Quaternary Science Reviews* 283: 107455.
Wurz, S. 2021. Technocomplexes and chronostratigraphy for MIS6–1 in southern Africa. *South African Journal of Geology* 124(4): 1083–1092.
Wurz, S., Bentsen, S.E., Reynard, J., Van Pletzen-Vos, L., Brenner, M., Mentzer, S., Pickering, R. & Green, H. 2018. Connections, culture and environments around 100 000 years ago at Klasies River main site. *Quaternary International* 495: 102–115.
Wurz, S., Pickering, R. & Mentzer S.M. 2022. U-Th dating, taphonomy, and taxonomy of shell middens at Klasies River main site indicate stable and systematic coastal exploitation by MIS 5c-d. *Frontiers in Earth Science* 10: 1001370. DOI: 10.3389/feart.2022.1001370
Yellen, J.E. & Brooks, A.S. 1989. The Late Stone Age archaeology of the !Kangwa and /Xai /Xai valleys, Ngamiland. *Botswana Notes Records* 20: 5–27.