Through a prism of paradigms: a century of research into the origins of the Upper Palaeolithic in the Levant

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"I have yet to see any problem, however complicated, which, when looked at in the right way did not become still more complicated"
Poul Anderson

Abstract: *In the Levant, the origins of the Upper Palaeolithic is closely linked to the question of modern human emergence. This paper reviews a century of research on the subject. The history of discoveries in Mount Carmel (1900-1945) is argued to have particular importance in shaping the debate, yielding both archaeological and physical anthropological remain that were initially considered to be "transitional" between modern humans and their Neanderthal predecessors. This perspective changed dramatically in the 1980s, with the introduction of the Replacement hypothesis, necessitating a new view of the IUP as a foreign, intrusive industry into the Levant. In recent years, distinctions between species in the Levant have been called into question, while ancient DNA evidence suggests there was genetic admixture between early humans and Neanderthal populations somewhere in the greater Near East. There is no archaeological evidence for a movement of peoples out of Africa, nor is there evidence for complete cultural continuity. New data from the Arabian Peninsula show that the most likely precursor of Levantine IUP technology was the Arabian Nubian technocomplex. Therefore, we argue that the Levantine IUP developed at the interface of the southern Levant and northern Arabian Peninsula.*

1 INTRODUCTION

For nearly one hundred years, prehistorians have sought to explain the origin, development, and inter-regional significance of the Levantine Upper Palaeolithic (UP). Along the way, great strides have been made in the descriptive details of lithic technologies, typological variability, geographic distribution, and absolute chronology; yet, we are only a little closer, at best, to truly understanding the early UP than we were when the likes of Neuville (1934) and Garrod (1938) first began to ask these questions. There has never been decisive support for any explanation of UP origins and development. Rather, competing models have risen to prominence at different times, influenced by the prevailing paradigm of modern human origins.

For better or for worse, the question of Levantine UP origins is historically entangled in the problem human emergence. To this day, the earliest UP assemblages are known from the Levant, suggesting that the initial MP-UP "transition," and its behavioral implications, might be rooted here. Serving as the land bridge out of Africa, the Levant was a demographic hub throughout human prehistory. Both modern humans and Neanderthals have been documented in the region prior to the Initial Upper Palaeolithic (IUP); however, the biological and cultural relationship between these species (if, indeed, they are distinct taxa), the timing of their occupations, and associated lithic technologies are debated. Consequently, the archaeological record tends to be implicitly and, at times, explicitly, linked with the current perception of modern human evolution. The Levant has long served as a prism of paradigms concerning the biological and behavioral emergence of our species, guiding and framing scholar's views of the archaeological data.

Generally speaking, there are three broad paradigms of modern human evolution that have historically influenced interpretations of the Levantine UP: **1)** a linear and local development from archaic to modern, **2)** total replacement, and **3)** replacement with occasional admixture. In the early years of research from the 1900s through 1970s, the evolution of Neanderthals to anatomically modern humans (AMHs) was thought to have taken place concurrently in different regions, nowhere expressed more clearly than in the Near Eastern skeletal record. A second, radically different paradigm was championed starting in the 1980s, at which time most scholarly thinking coalesced around the scenario of a uniquely African emergence of AMHs, who then went on to replace all other archaic species across the globe. While the multiregional paradigm of modern human origins retained some support, most interpretations of Near Eastern archaeological data shifted in line with total replacement.

We have now entered a new era, in which admixture is a real possibility. Although this option was previously considered in the literature (e.g. Ahrensburg & Belfer-Cohen 1998; Hawks & Wolpoff 2001), it has only recently been supported by empirical evidence. In a landmark study of the Neanderthal genome published in 2010, researchers first reported low levels of admixture between Neanderthals and modern humans (Green *et al.* 2010). On the heels of this breakthrough, more evidence has been produced indicating that modern humans may have interbred, to a minor degree, with archaic species in Africa, Europe, and Asia (Durand *et al.* 2011; Hammer *et al.* 2011; Reich *et al.* 2011; Skoglund and Jakobsson 2011; Alves *et al.* 2012; Meyer *et al.* 2012; Neves & Serva 2012). Moreover, based on a widespread distribution of the shared Neanderthal markers found among North African, European, Middle Eastern, and Asian populations, some geneticists have proposed that the locus of AMH-Neanderthal admixture was in the Near East (e.g. Yotova *et al.* 2011; Sanchez-Quinto *et al.* 2012).

This possibility has obvious and significant implications for interpreting the archaeological record of the region, making total replacement of both people and cultures much less likely.

While archaeogenetics necessitate a reappraisal of modern human emergence in the Levant, at the same time, we are now able to contextualize this process within a vastly expanded archaeological database from the Greater Arabian Peninsula. The recently invigorated Arabian research program has been driven, in large part, by the discovery of genetic signals pointing to the significance of the "Southern Dispersal Route" out of Africa (e.g. Quintana-Murci *et al.* 1999; Kivisild *et al.* 2004; Metspalu *et al.* 2004; Forster & Matsumura 2005; Macaulay *et al.* 2005; Oppenheimer 2009; Ghirotto & Barbujani 2011). Consequently, for the last decade, archaeological research projects have been combing the deserts of Arabia in search of physical evidence supporting these genetically-predicted population dispersals. Far from answering the question, several recent unexpected discoveries have only added further complexity to understanding of AMH movements and, perhaps, even development outside of Africa.

In reviewing these new data, we revisit the question of Levantine UP origins and development, offering a fresh perspective on an old problem. Considering the origins of the Levantine UP in light of recent genetic research and archaeological discoveries in the Arabian Peninsula, we suggest that the evolutionary trajectories of these two regions may have been inexorably intertwined.

2 THE FIRST YEARS: 1900 – 1945

From the beginning, the first excavated Levantine UP sites were seen as extensions of European industries and placed within a European taxonomic scheme (Zumoffen 1908; Buzy 1927, 1929). The first serious considerations of a distinct regional Upper Palaeolithic came from excavations at stratified cave sites in the coastal Mount Carmel range and inland in the Judean Desert. In the Judean Desert rockshelters, Neuville (1934, 1951) uncovered a stratigraphic sequence of assemblages characterized by distinct blade production, which at the time was considered to be a clear diagnostic marker of the Upper Palaeolithic. Meanwhile, Garrod's excavations in Mount Carmel during the late 1920s and early 1930s also unearthed stratified assemblages with a matching laminar reduction strategy (Garrod 1937, 1938; Garrod & Bate 1937).

The Mount Carmel excavations not only produced Upper Palaeolithic archaeological deposits, they also uncovered hominid remains associated with the underlying Middle Palaeolithic (MP) assemblages (Keith & McCown 1939). While these had no direct relationship with the Upper Palaeolithic cultural layers, they were to have a major influence on interpretations of local Upper Palaeolithic origins. The hominid skeletons at the time, from Tabun and Skhul, were all considered Neanderthals, yet they differed from European Neanderthals to the extent that Keith and McCown (1937:52) interpreted the Tabun specimens to be "closer to the form of humanity which was the parent of both the Paleoanthropic and Neanthropic branches of mankind than is the case with their western cousins" and the remains from Skhul to be "intermediate between Neanthropic and Neanderthal man… indicative of an evolution towards the modern types of man" (ibid). In short, they saw an evolutionary development from classic Neanderthal to a form heading toward modern man, referred to as "progressive Neanderthals" (McCown & Keith 1939).

Neuville's and Garrod's work in Mount Carmel and the Judean Hills culminated with the proposal of a six stage relative chronology for the entire Levant (Neuville 1934). The details of the sites excavated, the assemblages described, and the tools recognized as significant have all been published in detail, both in the original descriptive publications (Garrod & Bate 1937; Neuville 1951) and in more recent reviews of the history of the Levantine UP studies (e.g. Bar-Yosef 1980; Marks 1983a; Gilead 1991; Belfer-Cohen & Bar-Yosef 1999). These will not be repeated here; rather, we consider how these various researchers have perceived the UP and all it entails. While Neuville and Garrod each found very similar assemblages, they arrived at very different conclusions about them. Neuville had no doubt from where his Stage I UP came:

« L'introduction des cultures du Paléolithique supérieur correspond á l'arrivée d'un homme nouveau, éloigné de son prédécesseur néandertaloïde, mas qui conserve encore des caractères assez primitifs » (Neuville 1934:249).

He never indicated, however, from where the earlier, somewhat primitive moderns may have derived, and did not accept the Skhul specimens as the "missing link" between Neanderthals and moderns (Neuville 1934:245). Neuville's early UP Stages I and II had many diagnostic MP elements alongside UP features. This "mixture" of MP and UP traits adhered to his view that early moderns arrived in the Levant during the late MP, and that they co-existed with the local Neanderthals for some time (Neuville 1934).

For Garrod, it was a time of rapidly expanding data from her ongoing excavations; as such, her understanding of Levantine UP origins and significance changed as new information became available. Unlike Neuville, she took a broader view, considering a wide range of possible relationships, migrations, and diffusion scenarios. While recognizing the meager body of evidence, she saw the emerging Near Eastern UP as a source or, at least, an influence, for much of the European UP:

"The only stages of the Upper Palaeolithic of the West in which the Near East plays no part are the Solutrean, which apparently originates in Central Europe, and the Magdalenian, which arises as a specialized form of the Gravettian in Southern France" (Garrod 1937:39).

Initially, Garrod saw the local Levantine UP as "immediately succeeding" the MP Levalloiso-Mousterian, and as being "predominantly of the type known in Western Europe as Middle Aurignacian" (Garrod 1937: 36). Recognizing that no similar industry was known in Africa, she postulated that its origin might lie close by, perhaps, "in Iran, or even further east" and that it moved into Europe via the Crimea, where there was an "Upper Palaeolithic sequence closely resembling that of Palestine" (ibid). While Garrod found no early Aurignacian in Iran during her limited survey of the region, she presciently predicted that it would be found when more work had been done there. Although she posited a geographic origin for the Levantine UP to the East, she did not suggest from which earlier industry it evolved.

The problem that Garrod and others were soon to face was the epistemological issue of what actually constitutes an "origin" or "transition." Origins of industries are inherently difficult to recognize and define because, by their very nature, they involve either *in situ* transformation from one state to another or the relatively sudden appearance of something so different from what came before that no case could be made for autochthonous developmental change.

In the latter case, the question of origin becomes one of finding comparable materials in some adjacent region; however, this merely transfers the question to somewhere else. In essence, finding the root of a lithic industry first involves differentiating between continuity and discontinuity. In these incipient years of research, the data did not yet permit such resolution. It would still be several decades before serious consideration of Levantine UP origins could be undertaken.

3 POST-WWII EXPANSION: 1945 – 1979

The Second World War led to a brief hiatus in fieldwork, at which time few new sites were published (Haller 1942/43, Ewing 1947). Meanwhile, Garrod used the opportunity to reexamine some of her previously excavated Levantine samples, particularly those from the MP-UP interface at El Wad, which she had initially reported as mechanically mixed. On reconsideration, and comparing her samples with those from Turville-Petre's excavations at Emirah (Turville-Petre 1925), Garrod (1955) proposed an initial UP stage, which she called "Emiran." Because of the presence of both MP and UP tools in the Emiran, she interpreted this industry as being developmentally "transitional" between the local MP and UP (Garrod 1951:129). This proposed developmental continuity consciously paralleled that seen by McCown and Keith (1939) in the skeletal record, leading Garrod (1951:129) to speculate that the people who made the Emiran might have been biologically transitional between Skhul and more recent AMH specimens. From then on, the coupling of lithic technology and biological evolution has loomed large in our interpretations of the Levantine archaeological record. Garrod (1953, 1954) also shifted her interpretations of the early Levantine UP sequence – no longer the source for the European Aurignacian, now seen as a limited regional phenomenon that was deserving of a local, rather than European, nomenclature. She incorporated the Levantine taxonomic scheme into Neuville's six stage organization of the UP. While considering each of these stages as a separate industry, she saw them as a continuous evolutionary development that took place exclusively in the Levant.

Views of modern human evolution did not change in this time; rather, they became more explicitly articulated and integrated into the Levantine geological stratigraphic context (Howell 1959). Perhaps the most significant new perspective was Gonzalez-Echegaray's (1964, 1966) re-interpretation of the Levantine record. While he accepted Garrod's hypothesis that the Emiran was autochthonous, he believed that the later Aurignacian elements were the product of a migration from the north, resulting in a hybrid Aurignacian culture differing from Europe. This new view did not gain much support, but added to the myriad of speculations surrounding the Levantine Aurignacian.

In 1969, a historic conference held at the University of London shifted the focus of Levantine UP studies from the traditional Israeli sites northward into Lebanon. Ksar Akil, with its 18 m of deposits, was presented with considerable fanfare, sold as the first complete UP cultural sequence (Copeland 1975, 1976). In classifying the sequence, the authors retained Neuville's six stage chronology; yet, it was clear that Stage I at Ksar Akil was not the same as Stage I to the south. This marked the first indication of sub-regional differences within the Levant. Ronen (1976) further articulated these subdivisions in his local developmental sequence for northern Israel. Unlike the Ksar Akil sequence, the Stage I Emiran in the south was succeeded by an industry lacking "Aurignacian" elements. Still, the sequences were viewed as developmentally unilinear.

The original concept of the transitional Emiran was an industry that contained both MP tools made on MP blanks (Levallois flakes) and UP tools made on Upper Palaeolithic blanks (blades from volumetric cores) (Garrod 1951, 1955). After examining a number of Lebanese "transitional" assemblages, including Ksar Akil, Copeland redefined the essence of what made the transitional assemblages actually "transitional":

"We are not dealing here with a mixture of Middle Palaeolithic tools made by Middle Palaeolithic technology, and Upper Palaeolithic tools made by Upper Palaeolithic technology, but the characteristically Upper Palaeolithic tool types are found on blanks made by a Middle Palaeolithic tradition of flint knapping (direct percussion), on prepared cores, to produce Levallois blades or points." (Copeland 1975:337–339).

This was a major step forward, since it proposed a combination of technological continuity with typological change. The previous explanations failed to account for the presence of true Upper Palaeolithic blanks, and were less than convincing for some (e.g. Bar Yosef & Vandermeersch 1972). Copeland's developmental sequence did not simply view the Levantine UP in a vacuum, but took into account technological patterns seen in preceding Levantine MP industries. In the south, the Early Levantine Mousterian (or Tabun D type) at Rosh Ein Mor had significant numbers of UP tools. In particular, burins and endscrapers were found manufactured on elongated Levallois blanks, in conjunction with some MP tools that were well in the minority (Marks & Crew 1972; Marks 1975). This same pattern was reported at Tabun in Mount Carmel, where Bed 39 was not only characterized by a high laminar index, but also had 39 % "Upper Palaeolithic" tools (Jelinek 1975:307–310). The real change in the Emiran, then, was the absence of typical MP tools, as well as the presence of the Emirah point and, in the north, chamfered pieces (Newcomer 1970, 1971; Copeland 1975, 2001; Volkman & Kaufman 1983).

The pattern of developmental change seen in the Emiran, as well as technologically and typologically comparable elements found in Tabun D type Mousterian assemblages – only distinguished by the presence of MP tools – would have made a solid case for an autochthonous MP-UP transition. The problem was that Tabun D type Mousterian assemblages and the Emiran were separated in time by some 150 thousand years. Two other Mousterian assemblage types, Tabun C and B, seemed to fill the temporal gap, insofar as the Mount Carmel cave sequences was concerned (Garrod & Bate 1937; Stekelis 1954). Tabun C and B type assemblages have neither significant numbers of Upper Palaeolithic tools, nor do they produce many elongated blanks (see Bar Yosef 1998 for a concise description of technology and typology of these Mousterian types). The intellectual climate implicitly viewed Tabun's MP dated stratigraphic sequence as pan-Levantine, later made explicit by Bar-Yosef (1994:40), despite the fact that the archaeologically explored area of the Levant with dated occupations was restricted to the Israeli/Lebanese Mediterranean zone. To further confound matters, the latest Mousterian industry, Tabun B, was associated with Neanderthals (Suzuki & Takai 1970; Arensburg *et al.* 1985), rather than "progressive Neanderthals," as was expected had the cultural developmental sequence gone hand in hand with hominid evolution. Essentially, there was no base from which the transitional Emiran could have arisen within this pan-Levantine MP scenario. A similar situation existed for the development from Emiran into the "true" UP, in the sense of volumetric blade technology. Stage II, defined only on the basis of a few tools (Neuville 1951), could not be technologically linked to the Emiran. So, by the end of the 1970s, the Emiran was an accepted developmentally "transitional" industry, which had no obvious local progenitor and no clear descendent.

The publication of Boker Tachtit by the Central Negev project in the early 1980's would imminently fill at least part of this lacuna (Marks 1983b, 1983c), accompanied by the emergence of a new paradigm that effectively replaced the preceding evolutionary models and fundamentally shifted the perception of the MP-UP in the Levant.

4 TOTAL REPLACEMENT: 1980 – 2010

The period between 1980 and 2010 saw enormous changes in Near Eastern UP studies; the most visible was a new paradigm in human evolution that posited a recent African origin model for all modern humans. This, in turn, caused some changes in the perception of Levantine Upper Palaeolithic technological development within the "transitional" Emiran.

This chapter of Levantine UP studies began with Stringer's (1985) proposition that modern humans evolved exclusively in Africa, while Neanderthals diverged from their evolutionary line hundreds of thousands of years earlier, thereby relegated to a side branch of human evolution. Shortly after the publication of Stringer's "Replacement" (or "Out of Africa") model, a team of geneticists from the University of Berkeley pioneered the application of mitochondrial DNA (mtDNA) analysis to explore human phylogenetic history (Wilson *et al.* 1985; Cann *et al.* 1987). Their results led to the conclusion that all modern humans are descended from a single ancestral population that evolved in Africa some 200,000 years ago. "Out of Africa," bolstered by support from the burgeoning field of archaeogenetic studies, seemed to demolish the possibility of a hominid evolutionary continuum in the Levant. This new model certainly represented a radical change as to where the origin of anatomically modern people and, presumably, modern culture was to be found; yet, several questions remained unanswered. The model provided no more than a generalized time frame for AMH speciation, dispersal, and replacement from 200 ka to 40 ka (Klein 1994:7). There was no clear indication as to where, within the entirety of the African continent, this evolutionary process took place. Since the oldest known AMH remains had been discovered in East Africa, this became the presumptive region of human emergence. Moreover, scholars still had no clue as to which route(s) these anatomically moderns took when leaving Africa, or exactly when within the predicted 160 thousand year window of time, the exodus of behaviorally modern people took place, not to mention disagreement as to the very definition of anatomical and cultural modernity.

It is noteworthy that, as late as the mid–1990s, Stringer considered the Levant, in addition to Africa, as a potential point of origin (Stringer 1994:164). Yet, this was ignored by some archaeologists, whose focus had shifted from exploring specific avenues of a local Levantine Middle-Upper Palaeolithic transition, to a default position that Africa must be the source of the Upper Palaeolithic (e. g. Bar Yosef 2000; Tostevin 2003; Shea & Sisk 2010; Sisk & Shea 2011). Still, this paradigmatic shift only affected the perception of the Levantine Middle-Upper Palaeolithic transition; it in no way changed the expanding database related to it.

The discovery of anatomically modern remains at Qafzeh, Israel, and their morphological similarity to the Skhul specimens, (Vandermeerch 1981, 1992), provided the first tangible evidence for an early AMH population in the Levant. These were no longer viewed as "progressive Neanderthals" or "proto-Cro-Magnon"; rather, they were now classified as fully modern humans, albeit with some vestigial archaic features. Their presence in the Levant at around 100 ka (Vandermmersch 1992) provided both a specific route and timing for the Out of Africa dispersal.

Early human expansion from Lower Egypt into Sinai and the Levant was certainly reasonable and expected, particularly given the multitude of such movements through time: from Homo erectus to the armies of Ramesses II. Yet, although the Skhul/Qafzeh specimens were considered anatomically modern, they lacked those associated cultural traits that were thought to suggest "modern behavior" (e.g. Bar-Yosef 1995; Mellars 1996). In fact, their material culture was classified as Levantine Mousterian of Tabun C type, showing only slight differences in emphasis within the Levallois method from that which preceded it and that which followed (Meignen 1998; Hovers 2009). Thus, the assumed relationship between anatomical and cultural modernity, as traditionally argued for the Aurignacian in Europe (e.g. Mellars 1973), was decoupled in the Levant. The mere presence of anatomically modern people outside Africa did not necessarily signal the appearance of modern culture in an Upper Paleolithic form. Advances in ESR and TL dating confirmed that the Skhul/Qafzeh AMH remains predated the Levantine Neanderthals, leading some to speculate that this expansion was, in fact, a migratory "dead end" followed by a later wave of behaviorally modern groups out of Africa (e.g. Shea 2007).

Klein (1998:509) addressed the apparent disjunction between physical and cultural modernity by proposing that, prior to 50 ka, anatomically modern humans in Africa "were not behaviorally modern." He suggested that behavioral modernity came about due to a "neurological advance" after 50–40 ka, archaeologically seen in the shift from the Middle Stone Age (MSA) to Late Stone Age (LSA) in Africa (ibid: 510). The anomalously early date of 50–40 ka for the African MSA-LSA transition mainly rested on the thin reed of extrapolated obsidian hydration dates from Enkapune Ya Muto rockshelter in Kenya (Ambrose 1998), despite the fact that the beginning of the LSA observed in South Africa could not be documented before 24 ka (Klein 1998:511), anywhere in East Africa before 30 ka (Brandt 1986), and was not widespread there until ca. 20 ka (Barut 1994). Klein's hypothesis of a neurological development around 50 ka predicted a rapid shift to modern behavior, expressed in cultural traits such as hunting adaptation, social organization, and symbolic expression. His proposition was examined in detail and unequivocally rejected by demonstrating that all of these behaviorally modern characteristics had antecedents in the MSA (McBrearty & Brooks 2000).

Yet, the idea of a ~50 ka date for the exodus of anatomically/behaviorally modern humans out of Africa persisted, fueled in large part by the field of archaeogenetics, which had been growing increasingly influential in modern human research. The expanding database enabled a more complete understanding of mtDNA phylogenetic history, showing a common ancestral "trunk" in Africa from which all non-African stem: haplogroup L3. From L3, descendant lineages haplogroup M and N diverge. Based on the mtDNA mutation estimates available to them at the time, geneticists calculated a coalescence of these lineages between 70 and 50 ka (e.g. Endicott *et al.* 2009; Soares *et al.* 2009). The Near East remained the canary in the coalmine, however, since the earliest MP-UP transitional assemblages were to be found in the arid margins of the Levant, not in Africa, as geneticists and palaeoanthropologists expected.

Expanding into the arid margins

Until the 1980s, part of the problem scholars had encountered in trying to understand the origin and development of the Upper Palaeolithic was that so little of the region had undergone serious investigation, most of which was primarily restricted to the Mediterranean zone. This changed considerably in the 1980s, when researchers began to expand into the more marginal areas of the Levant.

One of the most significant contributions to UP studies at this time was the Central Negev Project's discovery of Boker Tachtit (Marks 1983c), where the basal Emiran occupation floor was dated to ca. 47 ka[1], and the uppermost IUP floor was dated to ca. 35 ka. The state of preservation allowed for large-scale core reconstructions and detailed descriptions of technological changes that took place during the MP-UP transition (Volkman 1983). As importantly, the Emiran itself was more clearly defined, beyond the two more or less type fossils (the Emireh point and the chamfered piece) and the oversimplified perception that its basic technology was Levallois and, thus, Middle Palaeolithic derived. These data have been published in great detail (Volkman 1983, 1989), summarized numerous times (e.g. Marks 1983a; Marks & Volkman 1983, 1985), so will only be briefly described here.

1. *All ^{14}C dates presented without calibration.*

The developmental technological changes at Boker Tachtit are seen in a temporal shift from a highly standardized, hard hammer bidirectional Levallois point and blade production, utilizing cresting in initial core shaping in Level 1, through Level 2, which exhibits a co-association between Levallois point production and hard hammer volumetric blade core reduction, mainly bidirectional but also at times unidirectional, to a marked shift away from bidirectional Levallois point cores and to an increase in unidirectional cores in Level 3, finishing with a wholly hard hammer volumetric blade strategy, predominantly single platform but with some bidirectional cores as well, in Level 4 (Volkman 1983). Thus, it begins with a Levallois point and blade reduction strategy and ends with an entirely non-Levallois blade strategy over four different occupations. While this technological shift was taking place, however, very little change occurred in the blanks produced, mainly blades and points, and for the tool assemblages, primarily retouched points, end scrapers, and burins (Marks and Kaufman 1983).

Across the Jordan Valley, several long term research projects were also initiated in heretofore unexplored areas: the Wadi Hasa Survey (MacDonald 1988) followed by Clark's Wadi Hasa Project on the eastern slopes of the Jordan Valley (e.g. Clark *et al.* 1987, 1988, 1992, 1994; Coinman *et al.* 1986, 1988, 1989; Olszewski 1997; Olszewski & Coinman 1998; Olszewski *et al.* 1990, 1994), as well as Henry's investigations throughout the southern Jordanian Plateau (e.g. 1979, 1982, 1985, 1988, 1994, 1995). For the first time since Buzy's (1927) work in the Sinai Peninsula, prehistoric exploration was carried out in southern (Philips 1987a, 1988) and northern Sinai (Bar-Yosef & Philips 1977; Gilead 1983, 1985; Gilead & Grigson 1984; Gilead & Bar-Yosef 1993).

At the northern end of the Levant, excavations were conducted at Karain Cave by joint Turkish/European teams (Albrecht 1988, Otte *et al.* 1995) and at Üçağizli Cave in Hatai Province (Kuhn *et al.* 1999). In the late 1990s, a fieldwork project was initiated north of Damascus in Syria by a team from Tübingen University (Conard *et al.* 2004). Excavations of deep Pleistocene stratigraphic deposits at El Koum in eastern Syria commenced in 1982 and are still ongoing, making the Palaeolithic of this region one of the best known areas in the Near East (e.g. Le Tensorer 2004; Boëda *et al.* 2001; Bourguignon 1998).

The Levantine Mousterian and Emiran

Extending the archaeological database into these new areas made it possible to better judge just how widespread was the Middle and Upper Palaeolithic of the Israeli/Lebanese littoral. Heading into the 1980s, three big questions remained unresolved: a) from what specific Levantine Middle Palaeolithic base did the Emiran arise, if any; b) how did the Emiran evolve technologically into a true Upper Palaeolithic; and c) could the Emiran be developmentally linked to the local Upper Palaeolithic, or was there a hiatus between them? In short, was the Emiran truly transitional between local Middle and Upper Palaeolithic industries?

Under the new replacement paradigm, it was assumed that the roots of the Emiran must lie outside the Levant. To bolster that case, technological differences between Tabun B type Mousterian and the Emiran were described that did not support developmental continuity (Tostevin 2000). Since it was widely accepted then that the Tabun sequence was linear, pan-Levantine, and Tabun B was linked to Neanderthals, logic dictated that researchers search elsewhere to locate the source of the Emiran. A few dissenting voices still claimed developmental continuity between the Emiran and a Tabun D lineage (Demidenko & Usik 1993, Marks 2003); yet, this perspective was mostly discounted.

In one sense, additional work outside the Mediterranean zone confirmed the prevailing Levantine Mousterian chronology, as no stratified sites were found that challenged the Tabun sequence. On the other hand, the three Tabun industries were clearly not pan-Levantine, and even within these types, assemblage turned out to be more diverse than previously thought (Hauck 2011). In the central and northern Negev, only Tabun D type was discovered (Munday 1976, 1979; Crew 1976), while there was no Middle Palaeolithic at all found by survey work in the southern Negev. In southern Transjordan, all but two Middle Palaeolithic sites were Tabun D type. These two sites, Tor Faraj and Tor Sabiha, found at high elevations of the Jordanian Plateau, were classified as Tabun B due to the characteristic predominance of unidirectional-convergent broad-based Levallois points. Yet, the assemblages also show a curious attribute that differentiate them from other Levantine Mousterian Tabun B type assemblages - the increased use of bidirectional preparation on smaller Levallois point cores (Henry 1997, 1998). At lower elevations of the Jordanian Plateau, the site of 'Ain Difla yielded a Tabun D type assemblage, while types C and B were not present at all (Lindley and Clark 1987, 2000). Surveys in Sinai located only one Middle Palaeolithic surface scatter that is "possibly" Tabun C type (Gilead 1985). In southern Sinai, two otherwise undescribed workshop-sites near Mt. Sinai were recorded (Philips 1987b), as well as "Nubian" Levallois cores mentioned near Jebel Urayf An Naquah (Schild 1998).

In the northern Levant, excavations at Katain Cave in Turkey uncovered deep Middle Palaeolithic deposits that were found to be technologically closer to the Iraqi and Balkan Mousterian than to any Levantine type (Yalçinkaya *et al.* 1992). This was true for most of Anatolia, where surface sites contain mainly small centripetal preferential Levallois cores (Yalçinkaya 1995). In eastern Syria, the Hummalian Industry is coeval with early Tabun D type assemblages (Richter *et al.* 2011), and is consistently found stratigraphically underlying Tabun C and B assemblages (Boëda *et al.* 2001). While the production of elongated blanks is characteristic of both Tabun D and Hummalian Industries, the latter is distinguished by a distinct toolkit and methods of retouch not seen elsewhere in the Levant (Hours 1982).

In sum, the emerging Middle Palaeolithic map now showed a Levantine Mousterian circumscribed to the north by the high Anatolian Plateau and to the south by the hyperarid deserts of Sinai and the southern Negev, to the west by the Mediterranean and to the east by the Black Desert of Jordan, sprawling eastward into Mesopotamia.

Mousterian of Tabun D type was found to be widespread across the Levant, extending from the Central Negev to northern Syria. Mousterian of Tabun C type appears more limited along the Israeli/Lebanese littoral, with the exception of its presence at El Koum in eastern Syria. Tabun B Mousterian has been documented in the Carmel Mountains, in eastern Syria, and at high elevations on the southern Jordanian Plateau, while it is absent across the arid territories of the Levant. So, with the exception of El Koum, Tabun B is restricted to the Mediterranean zone.

Considering the geographic distribution of these Levantine Mousterian industries within a temporal context, the absence of Tabun B sites in the southern steppic zone is particularly important. In the northern Levant, Tabun D assemblages are roughly bracketed between 270 and 150 ka. These dates vary widely, depending upon which dating method is used. In the case of TL, the range is 270 – 170 ka, while ESR produces results between 200 and 150 ka (Bar-Yosef 1998). In the same caves, TL and ESR measurements from Tabun C assemblages range from 170 ka to 85 ka (ibid). Given the dates on Tabun C materials at Qafzeh (TL average 92 ± 5 ka and ESR average 96 ± 13 ka), the real date of Tabun C is likely to be closer to 100 ka, than to 170ka. Tabun B assemblages either date between 60 and 50 ka by TL, or between 70 and 50 ka by ESR (ibid).

Dates from the southern Levant are considerably less consistent. The Tabun D type assemblage at Nahal Aqev was determined to be younger than ~80 ka, based on two Th/U dates (85.2 ± 10 and 74 ± 5 ka) from a travertine directly underlying the artifacts in the adjacent fossil spring. At 'Ain Difla, the upper Tabun D assemblages have been TL dated to 105 ± 15 and dated by ESR to 102.9 ± 12.9 ka (Bar Yosef 1998: table 1). Three TL dates for the Tabun B at Tor Faraj average 48 ± 2.7 ka (Henry 1998), making it contemporary with the youngest of the Tabun B levels at Kebara, Unit VI, dating to 48 ± 3.5 ka (ibid).

So, the chronological sequence from the southern Levant indicates that Tabun D type Mousterian lasted somewhat longer in the arid margins than it did in the Mediterranean zone, where there was a demographic replacement, presumably, by Tabun C toolmakers. These data also raise the possibility (granted, more dates would be useful) that Tabun D in the south persisted after 75 ka, thus, may again be considered a potential candidate for the technological base of the Emiran. As the Mousterian assemblage from Tor Faraj is contemporary with the Emiran at Boker Tachtit, there is a reasonable possibility that the Emiran may be temporally and geographically close enough to be related to either the southern Tabun D group, and/or the Tabun B type Mousterian at Tor Faraj, with its rather curious use of bidirectional point preparation.

Prior to the excavations at Boker Tachtit in the Central Negev (Marks 1977; Marks & Kaufman 1983), the Emiran itself seemed to have no temporal variability, although northern and southern facies were recognized (Copeland 1975). In both regions, it merely existed as an assemblage type chronologically sandwiched between the Middle and the Upper Palaeolithic. Rather than representing a process of dynamic developmental change, the Emiran was viewed as another static industry, so much so that a separate type list was proposed for it (Hours 1974).

Following the work of the Central Negev Project, it was surmised that the technological origin of the Emiran in the south should closely match that of Level 1 at Boker Tachtit (Marks 1981). The dominant production of points and elongated blanks, as well as the abundance of Upper Palaeolithic type tools, suggested that the Emiran might have come out of a modified Tabun D type technology, unlike any known at that time.

Subsequent excavations at 'Ain Difla produced materials in its upper levels (1–5) that closely match aspects of the Level 1 Boker Tachtit technology, both metrically and categorically, including the presence at both sites of retouched points with ventral blunting retouch on the proximal end (Demidenko & Usik 1993; Mustafa & Clark 2007).

The similarities are such that a good case could have been made for Levels 1–5 at 'Ain Difla being the progenitor to Boker Tachtit, Level 1, save for the problem of a 50,000 year interval between them. Even with this time gap, however, the technological similarities, including very esoteric ones for the Middle Palaeolithic (e.g., cresting of cores during preparation), makes it highly likely that both lie along the same developmental trajectory. Still, this does not answer the questions of how, when and where these particular "transitional" traits arose, such as the cresting of cores during early preparation, the bidirectional Levallois point core preparation, and the oddly consistent right side basal blunting of Levallois points.

The technological patterns documented within Emiran assemblages at Boker Tachtit and 'Ain Difla in the southern Levant differ somewhat from those observed in in the northern Levant. The clearest technological sequence was excavated at Üçağizli Cave, Turkey, spanning units F though I (Kuhn *et al.* 2009). Rather than opposed platform Levallois point production (only a single Levallois point core is noted out of 76 Levallois cores), the dominant reduction strategy involved unidirectional, elongated Levallois point cores (58 out of the 76). Without refittings, it is not possible to be sure whether a cresting technique was used for these Levallois cores, although some evidence from the site may point to this. In stratigraphic units F and Fb-c, there are 1.9 and 3.35 crested blades to each core, respectively, while in unit H1–3 there is 93 crested piece to each core (Kuhn *et al.* 2009, tables 3 and 6). Therefore, it is highly likely that Levallois blade core formation involved cresting as at Boker Tachtit, and even earlier at 'Ain Difla. Although blunting retouch on the basal ridge of Levallois points is not mentioned in the typological descriptions, at least two illustrated examples (Kuhn *et al.* 2009, fig. 10, 8 and 10) show basal blunting, one on the right side and one on the left.

How then should the lowest levels of Üçağizli Cave be thought of relative to Boker Tachtit? If the developmental sequence at Boker Tachtit is a representative example for the rest of the Levant, then it began with bidirectional Levallois point production and developed into hard hammer single platform volumetric blade production. In this scheme, the lower units of Üçağizli Cave would fit comfortably between Boker Tachtit Levels 3 and 4. Yet, the dates from Üçağizli Cave (Kuhn *et al.* 2009, fig. 6) indicate a somewhat later date compared with those levels at Boker Tachtit. The use of a cresting technique in Levallois core preparation, as well as the basal blunting of the Levallois points at both sites, indicates broad technological connections, while the presence of chamfered pieces but absence of Emireh points in the northern Levant suggest the development of a separate facies from that in the south. Together, the chronology and technology at these sites indicates that the Emiran spread from south to north. Yet, it did not seem to have expanded beyond the Levant; there are no Emiran sites found to the north in the mountains of Turkey or to the east in the desert interior. There was, however, a seemingly related assemblage found in northeastern Syria at El Koum (Bourguignon 1998), indicating that some coeval group occupied the desert oases of this region.

At present, there is insufficient information to know whether the Emiran or any related industry is present south of the Negev. Middle Palaeolithic level 1 (MP1) at Sodmein Cave, situated in the Egyptian Red Sea hills, included a toolkit comprised of burins and two Emireh points (Mercier *et al.* 1999).

If the MP1 toolkit is indicative of an Emiran occupation, Sodmein Cave may well represent an example of back migration into Africa; hence, parsimonious with the genetic proposition of a population movement from the Levant into Africa between roughly 50 and 30 ka (Olivieri *et al.* 2006). Moreover, although the core reduction systems from Sodmein Cave have not yet been described in detail, the presence of Nubian Levallois reduction throughout the lower Middle Palaeolithic levels is noteworthy, given its focus on opposed platform Levallois point production, not unlike Emiran core reduction. Although the evidence from Sodmein Cave is insufficient to draw any conclusions, the relationship between Nubian Levallois and Emiran technology in the northern Red Sea hinterlands of both Africa and Arabia may be a fruitful area of research.

For now, it certainly appears that the Emiran arose in the southern Levant, with its earliest known manifestation at 'Ain Difla starting in level 5, the base of which is TL dated to ca. 105 ka (Henry 1998, table 1; Clark *et al.* 1997). Since TL dates from Jordan are consistently older than their equivalent ESR dates (Henry 1998), and since the vast majority of the Emiran-related materials at 'Ain Difla lie above level 5, it is highly likely that the 105 ka date is too old and that the five uppermost levels at 'Ain Difla, in reality, are younger than 100 ka.

In situations of clear developmental continuity, as at Boker Tachtit, articulating the end of one major archaeological phase and beginning of another is an arbitrary exercise. The criterion used at Boker Tachtit was the distinction between those levels (1 through 3) that utilized the Levallois method for at least some of its reduction strategies, thus considered Middle Palaeolithic, and Level 4, in which the Levallois method was replaced by hard hammer blade production; hence, it was classified as Initial Upper Palaeolithic (Marks & Ferring 1988). Some authors, however, would place the Emiran under the general umbrella of the IUP, so as not to imply a connection to the Levantine Mousterian, implicitly contradictory to the out of Africa model (Bar-Yosef 2000; Meignen and Bar-Yosef 2003; Kuhn *et al.* 2009). The argument against considering the Emiran as locally transitional is partly because "Levallois" in and of itself is too "plesiomorphic" to be diagnostic (Kuhn *et al.* 2009). Yet, it is not the mere presence of Levallois, *per se*, that makes the Emiran transitional; it is the technological transition from a specific Levallois reduction strategy (i.e., bidirectional point preparation utilizing crested preparation) to a fully volumetric hard hammer reduction strategy that is significant. This specific bidirectional system was only found elsewhere at 'Ain Difla, and, perhaps, a tendency toward bidirectional re-preparation at Tor Faraj. In addition, crest preparation of unidirectional Levallois blade cores has not been described outside of Boker Tachtit, although it was likely present at Üçağizli Cave, as noted above, and at Tor Sadaf in Wadi Hasa, Jordan (Fox 2003, fig. 8.8).

These technological elements are clearly non-plesiomorphic, pointing to a local development, with its earliest known manifestation in the southern Levant. It is reasonable, then, that the change from "transitional" to IUP should be recognized somewhere along the continuum from a fully Levallois strategy to a fully volumetric one. From this perspective, calling the Emiran "Initial Upper Palaeolithic," with its predominant Levallois reduction strategy, is illogical. We maintain that the Emiran is essentially a local Levantine transitional MP-UP industry but whose full antecedents are not yet known; given the current state of research, it would be premature to exclude non-Levantine influences for some specific technological aspects of the Emiran.

The Ahmarian

In addition to changing views on the origins of the transitional Emiran, the 1980s also brought a major shift in the perception of the Levantine Upper Palaeolithic, when the unilineal sequence was replaced by a "two tradition" model (Gilead 1981; Marks 1981). This new view recognized a technological and typological dichotomy between those assemblages, mainly in the south, that were characterized by skilled blade production (Monigal 2003) and simple retouched blades, El Wad points, and simple end scrapers and burins, versus those, mainly in the north, that showed strong "Aurignacian" traits. The blade assemblages were grouped together under the term Ahmarian, while those with considerably less blade production and Aurignacian traits – carinated scrapers, polyhedric burins, lamelle Dufour, *etc.* – were grouped together as "Levantine Aurignacian." Temporally, the earliest was clearly the Ahmarian, with dates in the southern Levant beginning around 37 ka at Boker A (Marks 1983c) and in the northern Levant at Üçağizli at about 36/34 ka (Kuhn *et al.* 2009).

While the earliest known IUP assemblage was found at Boker Tachtit, Level 4 (Marks and Ferring 1988), there was a technological discontinuity between the hard hammer blade production in Level 4 and the fine soft hammer blade/bladelet production of the earliest Ahmarian at Boker A. This technological gap has been filled both in the north, at Üçağizli Cave (Kuhn *et al.* 2009), and in the south at Tor Sadaf in Jordan (Fox 2003). Even before this, however, the Ahmarian was seen as developing out of the Emiran (Bar-Yosef 2000; Marks 1993; Gilead 1991).

Most Ahmarian sites indicate rather ephemeral occupations and, since most are open-air sites in the desert, organic materials are rare. On the other hand, cave sites, such as Ksar Akil (Hooijer 1961) and Üçağizli Cave (Kuhn *et al.* 2009) in the north have well-preserved faunal remains, evidence of bone tool manufacture (Bergman 1987; Newcomer 1974), and perforated shells (Kuhn *et al.* 2009), both of which are considered criteria for "modern" behavior (e.g. Klein 1999; Mellars 2000; McBrearty & Brooks 2000; Bouzouggar *et al.* 2007; de'Errico & Henshilwood 2007). Whether these non-lithic artifacts are typical of the Ahmarian everywhere, or are geographically limited to the northern littoral cannot be ascertained, given the variable taphonomic processes in the northern and southern Levant. Albeit infrequent, they do occur in the south, including bone tools in the Wadi Hasa (Coinman 1996), as well as a bone point found at Abu Noshra II in Sinai (Phillips 1988). At the same time, the Emiran and Ahmarian levels at Tor Sadaf, while containing fauna, failed to produce either bone tools or perforated shells (Fox 2003), indicating that perhaps these features were rare in the southern Levant until the Late Ahmarian, as at Ein Aqev East (Ferring 1977).

By 32 ka, the Ahmarian was widely distributed across the Levant, from southern Sinai to northeastern Syria (Belfer-Cohen & Goring-Morris 2003a, fig. 1.2). Like the Emiran, it was neither found in the mountainous regions of Turkey, nor any farther east than El Koum in Syria. While Ahmarian sites are present in southern Sinai, there is yet no hint of either Emiran or Early Ahmarian in the Arabian Peninsula. Recent claims of Ahmarian farther afield, such as in the Caucasus and on the Don River in Russia (Hoffecker 2012) stem from an overly broad definition of the Ahmarian Industry, which is just one of a series of different early Upper Paleolithic industries based on blade/bladelet production (Tsanova *et al.* 2012).

The Levantine Aurignacian

The sites initially called Levantine Aurignacian (Gilead 1981; Marks 1981) were distinguished by a technology that produced mainly flakes, and a toolkit that included carinated, thick, nosed and, in the case of burins, either carinated or polyhedric forms, as well as lamelle Dufour. Considerable variability has been recorded within the Levantine Aurignacian; there are assemblages that truly look not only typologically like the French Aurignacian, such as Ksar Akil Levels VIII and VII (Bergman 1987) and level D at Hayonim Cave in Mount Carmel (Belfer-Cohen & Bar Yosef 1981), but also have bone tools, pendants made on teeth, and at Kebara, even two engravings of animals. Alongside the classic Aurignacian assemblages, there were also those where many "Aurignacian" tools were present, but which fit uncomfortably into traditional Aurignacian definitions (Williams 2003). It is not surprising that these latter findspots lacked bone tools and pendants, given that they are all from surface sites in the southern Levant with no organic preservation.

Based on the preponderance of radiocarbon dates (Phillips 1994), the earliest occurrence of the Levantine Aurignacian is at Kebara Cave in the Mediterranean zone, where it is dated to around 34 ka (Marks 2003:256), possibly as early as 36 ka (Bar-Yosef 2000:136). General consensus places the end of the Levantine Aurignacian at about 20ka (Belfer-Cohen & Bar-Yosef 1981), although at least one typical Aurignacian site in the central Negev, Ain Aqev, persists until approximately 17 ka (Marks 1976:230). Thus, it appears well after the Ahmarian and seems to disappear with no discernible progeny (Goring-Morris and Belfer-Cohen 2006). Along a parallel trajectory, the Ahmarian develops into the Epipalaeolithic, *sensu* latu, at about 23/20 ka or somewhat later (Henry 1983, Olszewski 2003).

The term Aurignacian was first applied in a Levantine context to the assemblage from Antelias Cave (Zumoffen 1908) positing a connection to the European sequence. This position came and went over the years, with Garrod at first theorizing it was the root of the European Middle Aurignacian, and later considering it as something quite distinct from its European counterpart (Garrod 1957). Many researchers over the years have grappled with the origin of the Levantine Aurignacian (see Williams and Bergman 2010:151–156 for a detailed history of the problem), from Garrod's initial view that it came from farther east, to the view that the Ksar Akil sequence documented a local development (Tixier and Inzan 1981, Mellars and Tixier 1989). In spite of the varying perspectives on its geographic source, most prehistorians tended to view the Levantine Aurignacian as intrusive into the Levant (e.g. González-Echegaray 1978; Marks & Ferring 1988; Kozlowski 1992; Bar-Yosef 2000; Marks 2003; Otte *et al.* 2007), while Williams and Bergman (2010) have conclusively and exhaustively documented that there was no developmental sequence between the Ahmarian and Levantine Aurignacian at Ksar Akil.

The geographic distribution of the two different variants of the Levantine Aurignacian (Belfer-Cohen & Goring-Morris 2003a, fig. 1.3 and 1.4) indicate a very limited distribution in the core Mediterranean zone for the "typical" Levantine Aurignacian, and a more southern but still limited, highland steppic distribution for the atypical Levantine Aurignacian, with the exception of it at El Koum. The distribution of the more classic Levantine Aurignacian suggests that it was adapted to the wetter Mediterranean environment, rather than to the drier settings of the southern and eastern Levant. This might indicate that the Aurignacian did not enter the Levant from steppic or arid areas, which certainly seems to be the case to the south, as there are yet no known Aurignacian-like assemblages in the Sinai, Arabian Peninsula, or, for that matter, northeast Africa.

5 UNVEILING ARABIAN LATE PLEISTOCENE PREHISTORY

Since the earliest days of research in the Greater Near East, the Arabian Peninsula was thought to have played a significant role in modern human origins, even dubbed the "cradle of *Homo sapiens*" (Field 1932), but posed logistically and politically insurmountable obstacles for carrying out research. Hence, the region languished in obscurity relative to the rest of the Near East for most of the 20th century. That is not to say that scholars were unaware of its potential. On his historic crossing of the Rub' Al Khali sand sea, Philby (1933) documented evidence of an ancient lake in the eastern desert, complete with lithic artifacts strewn about the beach. To some degree, knowledge of the profoundly different Pleistocene landscapes of Arabia has driven Palaeolithic research throughout the Peninsula and provided the theoretical framework for understanding prehistoric occupation of the region (for comprehensive summaries of palaeoenvironmental oscillations and their speculative demographic implications see Parker & Rose 2008; Preusser 2009; Rose 2010; Rosenberg *et al.* 2011).

Over the winter of 1937/8, Caton-Thompson (1939) conducted the first serious Palaeolithic investigation in the Arabian Peninsula. Raising the possibility of early human exchange across the Red Sea, Caton-Thompson's expedition to the Hadramawt Valley in central Yemen searched for similarities between Arabian and African Palaeolithic industries. She documented lithic assemblages of various types on different terraces of the Wadi Hadramawt, but did not discover any significant features reminiscent of known African sites at the time. In the end, she concluded there were no Pleistocene connections across the Red Sea (Caton-Thompson 1957).

Around the same time, petroleum geologists searching for oil in the Rub' Al Khali and Nefud deserts of central Arabia reported numerous lithic scatters across the expansive dune fields (Field 1955, 1958). By the late 1970s, archaeological survey in central Arabia began in earnest. The Comprehensive Archaeological Survey Program was initiated in Saudi Arabia - a decade-long investigation that documented scores of new prehistoric sites, including several identified as "Mousterian" based on the presence of Levallois technology (both centripetal and convergent), and "Upper Palaeolithic" based on the presence of blade-dominated assemblages similar to the Levantine UP (Adams 1977; Parr 1978; Zarins *et al.* 1979, 1980, 1981, 1982).

In southern Arabia, under the direction of Amirkhanov (1994, 2006), the Soviet expedition to Yemen also began to document laminar-based "Upper Palaeolithic" assemblages in the central and eastern regions of the country. A French survey near Shabwa in central Yemen reported a few intriguing Levallois cores with affinities to the African Nubian Complex (Inizan and Ortlieb 1987). In southern Oman, just across the Yemeni border, a Harvard expedition to the Dhofar region recorded dense concentrations of surface assemblages characterized by the frequent manufacture of blade-proportionate blanks (Pullar 1974, 1985; Pullar & Jäckli 1978). The same again was reported from an expansive surface scatter near Saiwan in central Oman (Biagi 1994). Despite all of these tantalizing findings, the lack of stratified sites anywhere in the Peninsula, and directly comparable industries elsewhere, prevented cultural or chronological classification of these surface sites. Yet, it established the potential presence of Middle and Upper Palaeolithic populations in the very heart of Arabia, and suggested some degree of cultural and/or demographic exchange at various times with both the Levant and northeastern Africa.

A landmark genetic study published in 1999 further served to shift the focus of modern human origins research to Arabia, ushering in a new era of archaeological fieldwork throughout the Peninsula. Quintana-Murci (*et al.*'s 1999) discovery of mtDNA haplogroup M1 bearing populations in Ethiopia was thought to represent the first branch from an initial founding population. The discovery of a basal M clade in East Africa – an otherwise predominantly Asian lineage – lent credence to the posited "Southern Dispersal Route" out of Africa (e.g. Tchernov 1992; Lahr & Foley 1994). The study was followed by more extensive genetic research tracking relict early human populations across South Asia (e.g. Kivisild *et al.* 2004; Metspalu *et al.* 2004; Forster and Matsumura 2005; Macaulay *et al.* 2005), ultimately crystallizing in the coastal expansion model of modern human emergence (Stringer 2000; Mellars 2006; Oppenheimer 2009). At this point, the only thing missing was direct archaeological evidence from Arabia itself indicative of a population expansion out of East Africa around 60 ka BP.

This elusive connection to Africa became the focal point and MacGuffin of archaeological fieldwork in Arabia. The period between 2000 and 2012 witnessed a flurry of activity in Arabian Palaeolithic research (for a history of research see Rose and Petraglia 2009; Groucutt and Petraglia 2012). Of particular note are four recently discovered Late Pleistocene archaeological sites, which shed unexpected light on early human prehistory in Arabia. These include the Wadi Surdud site complex on the western flank of the Yemeni highlands (Delagnes *et al.* 2012), Jebel Faya in Sharjah, UAE (Marks 2009; Armitage *et al.* 2011), the Nubian and Mudayyan industries in southern Oman (Rose *et al.* 2011; Usik *et al.* 2012), and a series of stratified Mousterian Middle Palaeolithic occupations from the Jubbah palaeolake basin, northern Saudi Arabia (Petraglia *et al.* 2011, 2012). Contrary to most genetic and palaeoanthropological expectations, not one site was found along the coast, and no indications of a Pleistocene population expansion from Africa after 75 ka have been found to date.

What is also surprising about these discoveries is that they show only a minor degree of technological overlap with one another, pointing to a complex demographic history comprising mosaic source populations. This is not surprising, given the Peninsula encompasses some 3.3 million square kilometers – ten times the size of the Levant. Additionally, taking into consideration lower sea levels during most of the Late Pleistocene, Arabia abutted the entirety of the Levant, Mesopotamian floodplain, and Zagros Mountains, with no significant geographic borders separating these regions. Should we consider Jubbah basin, for instance, as belonging to northern Arabia or the margin of the Levant? Strong wet phases, such as those experienced between 125 and 75 ka, appear to have facilitated a virtual land grab of multiple hunter-gatherer range expansions onto the Peninsula from all directions.

The earliest potential indication of modern human presence on the Arabian Peninsula comes from Jebel Faya Assemblage C, where excavators noted broad similarities to the East African MSA, positing an early wave of AMH expansion into Arabia during the Last Interglacial (~125 ka). Recently, Assemblage C has been specifically linked with an East African Eritrean site, Asfet (Beyin 2011:8), where comparable technological and typological patterns were observed. The overlying Assemblages B and A at Jebel Faya, loosely bracketed between 90 and 40 ka, do not resemble any other known Arabian, African, or Near Eastern assemblage types; thus, are interpreted as an autochthonous industrial development unique to the Gulf basin region of eastern Arabia (Marks 2009; Rose 2010; Armitage *et al.* 2011).

In contrast, Late Pleistocene archaeological sites found outside of the Gulf basin exhibit connections to both the Levant and Northeast Africa. Evidence for a distinct, widespread expansion of AMH toolmakers comes from several hundred Nubian Complex findspots reported across Hadramawt, Dhofar, the southern Rub' Al Khali, and central Saudi Arabia (Inizan & Ortlieb 1987; Crassard 2009; Crassard and Thiebaut 2011; Rose *et al.* 2011; Usik *et al.* 2012). A dated "Classic Dhofar Nubian" assemblage (*sensu* Usik *et al.* 2012) at Aybut Al Auwal places the expansion of Nilotic MSA populations into southern Arabia around 106 ka (Rose *et al.* 2011). Although the fate of these toolmakers in Arabia remains a mystery, at least in Dhofar, the descendant "Mudayyan" industry demonstrates Nubian-derived characteristics. Alongside the production of diminutive Nubian Levallois cores, Mudayyan reduction strategies include recurrent bidirectional point cores and simple unidirectional blades struck from the narrow elongated face of chert slabs (Usik *et al.* 2012).

Lithic material from the Jubbah basin, excavated from stratified deposits dated to around 75 ka, show different Levallois reduction strategies described as both centripetal and unidirectional-convergent Levallois, mirroring the range of Levantine Mousterian types (D, C, and B). The paucity of formal tools and small sample sizes, however, do not allow for any detailed technological or typological comparisons. At the Wadi Surdud site complex in Yemen, assemblages dated between 63 and 42 ka were found interstratified within a 6 m fluvial accretion (Delagnes *et al.* 2012; Sitzia *et al.* 2012). The industry was assigned to the Middle Palaeolithic and is characterized by a combination of occasional Levallois and, more frequently, non-Levallois convergent laminar reduction strategies. Excavators describe the unidirectional convergent reduction strategies as "the hallmark of the late Levantine Mousterian," while also noting that the tendency toward elongation and de-emphasis on platform faceting more resembles the preceding Tabun D type, rather than the contemporary Tabun B type (Delagnes *et al.* 2012:20). On the basis of significantly earlier dates for the Tabun D industry in the Levant and absence of Tabun D tool types at Wadi Surdud, the authors discount a direct connection between Wadi Surdud and the Levantine Mousterian, suggesting rather that they may both be derived from a common cultural base.

In sum, the emerging picture of the Arabian late MP is one of regional diversity, stemming from populations sharing a mix of African, Levantine, and Arabian ancestry. The Peninsula appears to have been a demographic sump during the wet phases that occurred between 125 ka and 75 ka, while fluctuating arid conditions between 75 and 15 ka led to a contraction of hunter-gatherer groups into local Arabian refugia. The presence of seemingly indigenous occupations at Wadi Surdud and Jebel Faya B, both during periods of aridity, attests to the ability of early human groups to survive in Arabia during climatic downturns.

6 DISCUSSION

After a century of research, the origins of the Levantine UP still remain an enigma. At this point, at least one thing is clear: the Emiran has no African progenitor. As such, there is a disconnect between the archaeological database and the Replacement paradigm, which necessitates that the earliest Levantine Upper Paleolithic must have come fully developed from northeast Africa. The Replacement model should have been a parsimonious prism through which to view the transition from the MP to the UP in the Levant. It was not. In fact, the data that have accumulated over the past thirty years have consistently negated the model, to the extent that even the molecular clock used to estimate the mtDNA L3 coalescence age (hence, AMH population expansion from Africa) may need to be radically recalibrated to 125 – 100 ka (Scally & Durbin 2012). For Replacement to serve as an effective paradigm, it should clearly explain the Mousterian-Emiran-Ahmarian sequence as being non-developmental. In addition, it should encourage debate as to which African lithic industry was brought to the Levant by African émigrés some 50 ka years ago.

For the most part, neither has happened. Emerging data have filled the technological and temporal gaps in the proposed Emiran-Ahmarian continuum, while detailed comparisons between 'Ain Difla and Boker Tachtit clearly show continuity. In spite of this, some still promoted the Replacement paradigm and ceased considering a local source within the Levant (e.g. Bar-Yosef 2000:142). To further make this case, Tostevin (2000) attempted to demonstrate that the technologies of Tabun B type Mousterian and that from Boker Tachtit, level 1 were different. Contentious methodology aside (Belfer-Cohen & Goring-Morris 2003b: 278; Marks 2003:261–264), the study was based on the premise of disproving a connection between the Emiran and Tabun B Mousterian, which no one had actually proposed.

Finding the cultural source of the 50 ka old African émigrés was also not as straightforward as the Replacement model predicted. Bar-Yosef (2000) made such an attempt, linking the lower Egyptian Taramasan with the Emiran, but later (Meignen & Bar-Yosef 2005:173) revised this position, stating that "the evidence from Africa is still insufficient for validating this hypothesis." There is unanimous agreement among researchers who have worked in the Nile Valley that there is no clear connection between Egyptian/Sudanese industries dated between 70 and 40 ka and those from the Levant (Marks 1990, 1992; Van Peer 1998; Vermeersch 2001).

Most recently, Meignen (2012), while recognizing and even emphasizing the intra-Levantine technological complexity of the Emiran (her IUP), corroborates the position of Demidenko and Usik (1993, 2003): "with our current state of knowledge, strong exterior influences do not appear necessary to explain the transformations observed in the lithic productions in the Levant, and in any case, we have so far no convincing archaeological evidence on hand to demonstrate such an influence" (Meignen 2012:19).

Rather, she sees a "stimulus for new combinations of pre-existing technologies" (ibid: 19). Such new combinations include the use of a cresting technique in core preparation, the shift from unidirectional to bidirectional point core preparation, and even blunting of the right side of Levallois points (as consistently seen in the Emiran). This last trait also occurs in the Egyptian Taramsan (Van Peer *et al.* 2010), but the other "new combinations" - the use of opposed platforms in point core production and the use of dorsal cresting in their formation - are not characteristic of the Taramsan, while both occur in the Mudayyan industry of Oman (Usik *et al.* 2012).

Consequently, this "stimulus" may, in fact, be in the form of demographic/cultural input from the Arabian Peninsula, rather than directly from Africa. We tentatively suggest that some cultural manifestations influencing the development of the Emiran around 50 ka might have arisen in Arabia – the progeny of Nubian Complex toolmakers who had expanded onto the Peninsula during the Last Interglacial. That is not to say such influences resulted from a rapid migration or one event; rather, from gradual, episodic expansions northward of the Arabian Nubian Complex, suggested by Nubian Levallois findspots recorded in the Rub' Al Khali and central Saudi Arabia. At the same time, there is possible evidence of southward range expansions from the Levant, indicated by the seemingly classic Mousterian assemblages found at Jubbah basin dated to ca. 75 ka and Tabun D-like assemblages found at Wadi Surdud in Yemen dated to ca. 55 ka. Thus, the possibility of contact in the southern Levant or northern Arabia must be considered. This proposed "Arabian Crucible" scenario is in agreement with the estimation of Neanderthal-AMH admixture in the Greater Near East between roughly 40 and 80 ka (Sankararam *et al.* 2012), occurring over a prolonged period of infrequent interbreeding (Neves & Serva 2012). It is also parsimonious with reports of relict mtDNA N haplotypes found among modern populations in Arabia, with coalescence age estimates between 60 and 50 ka (Fernandes *et al.* 2012) – remnants of the basal node of the European/West Asian modern human branch.

For this to be true, we must accept the position that Late Pleistocene Near Eastern hominids were a single admixed species, not distinct Neanderthal and AMH populations, and that the developmental sequence established at Tabun is not pan-Levantine and not necessarily linear. The absence of Tabun D type assemblages in the Mediterranean region after 150 ka may only signify a retreat into the Saharo-Arabian phytogeographic zone, and not the disappearance of this population from the Near East altogether. Hence, we suggest a local sequence where the Emiran develops, primarily, out of a Tabun D technological system in combination with external stimulus from residents of Arabia. A strong wet phase across central and eastern portions of the Peninsula between 55 and 50 ka (McLaren *et al.* 2008; Parton *et al.* nd) might have facilitated range expansions and demographic exchange in both directions.

At this point, however, too little is known about the complexities of Arabian Late Pleistocene prehistory to point conclusively to any specific demographic/cultural influences that might have contributed to the development of the Emiran, beyond general Nubian Levallois characteristics (i.e. opposed platform point production and the use of a dorsal crest in Nubian point core formation). The recent data from Arabia only begin to fill in huge gaps of information across a vast terra incognita. We have argued that the emerging picture necessitates a reconsideration of the Levantine MP-UP developmental sequence within the context of the Greater Arabian Peninsula, as a whole. For thirty years, researchers have failed to identify an African industry that was the source of, or influenced the development of, the Levantine UP. Rather than searching for an external stimulus on the Emiran in Africa, the answer may lie somewhere in Arabia.

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