Rock Art of the Qsur and ‘Amour Mountains, Algeria

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A Cognitive Approach

By

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This book is dedicated to my lovely wife Rosemary
Sokas and to my children, Nora, Sara, Adam,
and their families

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- I -

PALEOANTHROPOLOGY OF THE MAGHREB

INTRODUCTION

The painter, Paul Valéry said, ‘takes his body with him’, meaning that visual art, including rock art, is an embodied experience. Indeed, the production and experience of art relies on the full range of senses the human animal possesses. As a point of self-reference and an orientational center, the working body of an artist is ‘an intertwining of vision and movement,’ or displacement in space (Merleau-Ponty 1964). While in vision the body is aware of itself as located—occupying a position in space—it is hearing and touch that give rise to the awareness of the self as embodied (Hopkins 2004, 160). Body awareness also arises from kinesthesia and one’s sense of balance. Indeed, the brain experiences space kinesthetically, using sensory messages that affect the skin, muscles, joints, and tendons. ‘In many of the functional correlations of the senses, it is the kinesthetic sense that provides a common denominator’ (Arnold 1979, 4). Understanding the body as a bundle of sensory and motor functions, therefore, can shed some interesting light on the drawing activity and the images that populate rock art.

This activity of drawing is aptly described in Alexander Calder (1973: 62):

> First, the eye and the brain, or the brain alone, must act and determine what is desired to place on canvas or paper. This is a mental process. The second process is physical, for the hand must so control the pencil or brush that the desired effect may be obtained, that the image the eye has carried to the brain may be correctly transmitted to canvas or paper.

The essential import of this description is that, like all arts, rock art was created via motor control which, with input from other brain areas, translates visual features and movements registered in the parietal cortex (or retrieved from memory) into a graphic likeness of animals or humans, and is executed on a two-dimensional surface. That is, pictorial representations are the result of distal manual manipulation and matching of action-as-seen and action-as-done. Underlying this process are complex neurological mechanisms and psychological dispositions, which engage the visual, auditory, tactile, and kinesthetic functions of the body. This book explores these mechanisms then examines their possible manifestations in the production and appreciation of one of the most interesting sites of rock arts in the world, the Qsur and ‘Amour Mountains of Algeria.

One of the most active neural functions in the production of rock art is the mirror neurons system—the parts of the brain that regulate perceptual and motor skills involved in matching action-as-seen to action-as-done. The action of the mirror neurons system is key to both the acquisition of the visuomotor skills that are relevant to drawing, as well as the deployment of these skills. The acquisition and honing of these artistic skills also require a reward structure, which derives from psychological dispositions and social reinforcement.

Significantly, the mirror neuron system is also implicated in the activation of empathy, which influences both the content and stylistic projection of a rock art scene. Empathy also determines the intensity of excitatory and inhibitory actions of the mirroring system which encodes the observed action and triggers somatosensory and motor skills that are conducive to kinematic congruence.

Though not fully understood, other conscious and unconscious processes are also involved in aesthetic behaviors such as the production of art. As discussed in the chapter on dream-flying and metaphors, some of these processes are rooted in language, personal experiences, collective memories, and general sensibilities of native communities.

As mentioned above, a reward structure is needed to sustain artistic vocation. Primarily, this structure is based on pleasure, which artistic activities provide. Studies of pleasure and art have shown that there is a ludic character to art, which points to a deep connection between play, creativity, and aesthetic development. Spontaneous and self-rewarding, play enhances sensory, cognitive, and motor activities, which, in turn, facilitates the development of new cerebral pathways and creative thinking. Creative playfulness, as the book shows, is realized in many ways in the Qsur and ‘Amour rock art, oftentimes with great sophistication and profundity. This will become most evident in the chapter exploring the use of the continuous line technique to create monumental scenes as well as intricate labyrinthine images.

A rock art drawing or painting is more than a recreation of a perspectival structure of vision with an implied location from which depicted objects are presented. When kinesthesia is considered, rock art becomes a moment of parallactic flow and movement that is captured and given a graphic expression. Painting and drawing are usually about stilling the movement of the depicted objects and the instilling of movement in the inert ones. In rock art, there are instances where scenes seem to exude some of the tactile and kinesthetic actions that are associated with the relevant artistic experience. In the Qsur and ‘Amour rock art, this articulation of kinesthetic empathy is realized using a combination of perspectival projection, placement, and topographic features of the rock art site to structure optic flow, induce motion, and transform rock art into an installation, or environmental, art.

In the exceedingly empathetic character of the Qsur and ‘Amour rock art, there is a demonstration of the synesthetic abilities of the body and the cross-modalities of perception and creativity that can be skillfully expressed in art. A clear manifestation of synesthetic action in art is articulated in the unique way in which the Qsur and ‘Amour artists captured the sounds of their natural world and gave their acoustic experiences a graphic depiction.

Beyond conveying auditory, tactile, and kinesthetic empathies, the Qsur and ‘Amour rock artists also excelled in depicting scenes of contact with animals, expressing their empathy for non-conspecifics.

Richly illustrated, the book provides a cognitive analysis of the Qsur and ‘Amour Mountains of Algeria, stressing the role of empathetic engagement in aesthetic behavior and the role of the sensory and perceptual mechanisms underlying the richness of this art.

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CHAPTER ONE

THE MAGHREB AND THE ORIGIN OF ANATOMICALLY MODERN HUMANS

Based on biological similarities and common descent, living things are grouped in classes, orders, families, genera (sing. *genus*) and species. As a separate group within the class of mammalians, the order of primates includes the family of Hominidae (hominids: Great apes–Pongo, Gorilla, Pan– and Homo), the subfamily Homininae (African apes–Gorilla, Pan– and Homo), the tribe of hominini (chimpanzees and Homo), and hominins (Homo, including fossil human-like, bipedal apes, and modern humans)

Both DNA (structures providing codes to produce proteins) and paleoanthropology (studies of the evolutionary changes behind the rise of the early hominins), indicate that modern humans are closely related to the group of primates that includes chimpanzees and gorillas.

Biological changes are the result of mutations in the genes that affect a species as it adapts to environmental constraints.

While natural selection promotes various modalities of biological improvement, specialization, and functional efficiency, in hominins these adaptations gave rise to increasing cognitive capacities, enabling these species to develop culture and create their own niches. In the process, culture 'markedly reduced the impact of natural selection,' allowing for selective pressures deriving from social and psychological disposition to increasingly influence reproductive differentials. In humans, this evolutionary process has been referred to as self-domestication (Huxley and Baker 1974; Bellah 2011; Bednarik 2011; Achrati 2016).

Morphologically, primates are distinguished by hands with five digits and an opposable thumb, nails instead of claws, and a well-developed mobility of arms and legs. They also have stereoscopic and full-color vision, and distinct dental features. Another behavioral change that preceded bipedalism and was important in the evolutionary path of hominins is vocalization, which, as Paul D. MacLean (1985) has suggested, may be associated with evolutionary limbic change in the mammalian brain. Vocalization is not equivalent to verbalization, though they both involve larynx and supralaryngeal tract. The major development in vocal ability relates to the position of the larynx in the throat, the size of the oral cavity and the control of the tongue.

Hominins are further distinguished by bipedalism (Wilson 1998, 161; Howells 1993, 51; P. and A. Angela 1993, 45; Lovejoy 1993, 15; Achrati 2016; Bednarik 2011).

Some of these evolutionary changes are traceable in the fossil records of early hominins who lived between 6 and 2 million years ago (Mya). Although there is still a fossil gap between the earliest hominins and their likely ape ancestors, it is thought that a common human-ape ancestry existed from 8 to 6 Mya. The oldest hominid fossils discovered so far include *Sahelanthropus tchadensis* from Chad (*c.* 7 Mya), *Orrorin tugenensis* from Kenya (*c.* 6 Mya), and *Ardipithecus ramidus* and *Ardipithecus kadabba* (5.5 - 4.4 Mya), both from Kenya (Brunet, Beauvilain, Coppens, Heintz, et al. 1995).

A group of hominids known as *Australopithecus* emerged between 4 and 2 Mya in eastern Africa, including *Au. anamensis, Au. afarensis, Au. africanus, Au. garhi,* and *Au. sediba.* As indicated in the Laetoli footprints of three hominins from Tanzania dating to about 3.7 Mya, as well as the skeletal remains of Lucy, who lived in Ethiopia around 3.3 Mya, these *australopithecines* acquired bipedalism, or the ability to consistently stand and walk upright. Parallel to these *australopithecines* lived a group known as *Parantropus* (3 to 1.2 Mya). This genus includes *P. robustus, P. aethiopicus* and *P. boisei* and is outside of the ancestral line of humans. As to *Kenyanthropus platyops* (3.5-3.3 Mya), it seems to be of an indeterminate relationship to the ever-changing hominin tree (Robson and Wood 2008). This is also true of *H. naledi,* a previously unknown species of extinct hominins, recently discovered in the Rising Star cave system, in South Africa. Its body is small and has a cranial capacity similar to earlier *australopithecines.* It has humanlike hands but with a slight curving, an indication of recent arboreal motility. It also has a humanlike foot and lower limb (Berger, Hawks, De Ruiter, Darry, *et al.* 2015).

Along with the *australopithecines, a* genus of *Homo* identified in the fossil record as *Homo habilis* appeared between 2.3 and 1.6 Mya, as did two other species, *H. ergaster* and *H. rudolphenis,* both dating between 2.5 and 1.9 Mya. There is a disagreement as to whether these habilines are descendants from *Kenyanthropus platyops* (3.5 - 3.3 Mya), or whether *platyops* is in the genus of *Homo.* With small teeth and a cranial capacity of 600-750 cubic centimeter (cc), the habilines have a brain about 45% larger than *Australopithecus.*

One of the habilines, most likely *ergaster,* gave rise to *Homo erectus.* With flat forehead, but a brain size at about 900-1000 cc, *H. erectus* is found in Indonesia (Ngandong, Mojokerto, and Sangiran) dating to *c.* 1.80 Mya. In Europe, it is found at Dmanisi, in Georgia, dating to *c.* 1.7 Mya. The oldest known *erectus* in Africa is from Kobi Fora (KNM-ER 3733), dating to about 1.78 Mya.

It is generally thought that *H. erectus* and/or an ancestral hominin, if any, dispersed out of Africa around 2 Mya, which may have been in response to a major climatic change.

Archaic *H. sapiens*

Reflecting different adaptive patterns, hominins divergent from *erectus* began appearing during the Middle Pleistocene between 700–400 ka (thousand years ago). Showing sloping forehead, pronounced brow ridges, a marked chin on a projecting face and a lighter skull with a large brain, they represented an archaic form of *H. sapiens,* a precursor to modern humans. Known fossils of *H. sapiens* from this period are morphologically so diverse as to suggest the existence of more than one species. They are found in many places in the Old World, including, for example, in China (Zhoukoudian, Yiyuan, Chenjawo, Hexian, Yanxian, and Dali), Taiwan (Penghu fossil), India (Narmada), Tibet (the Xiahe mandible), Israel (Zuttiyeh), Indonesia (Ngandong), Zambia (Kabwe), Ethiopia

(Bodo), Tanzania (Ndutu) South Africa (Border Cave and Klasies River Mouth, Elandsfontein), Greece (Petralona), France, (Arago), Spain (Atapuerca), England (Swascombe), and Germany (Steinheim Mauer). The tendency now is to group these intermediate fossils under the designation of *H. heidelbergensis* (same as *H. rhodesiensis*).

Around 300 ka in Europe, *H. heidelbergensis* evolved into Neanderthals. Adapted to cold climates, the Neanderthal were robust, and distinguished by a mild facial projection, a retro-molar space between the last molar and the upright part of the jaw, a large nasal cavity, and a large brain. In addition to Europe, Neanderthals also existed in western Asia; they disappeared around 30 ka (Stringer 2016; Harvati, Hublin, and Gunz 2010; Shreeve 1995; Howells 1993).

Evolving parallel to the Neanderthal and interbreeding with it is the *Denisovan* species, discovered in 2008 in southern Siberia. DNA analyses revealed that the Denisovan lived until about 40 ka and shared a common ancestor with modern humans and Neanderthals about 1.0 Mya (Bailey, Hublin, and Anton 2019). Neanderthals and Denisovans are estimated to have diverged around 450 ka (Chen, Welker, Shen, Bailey, *et al.* 2019; Teixeira and Cooper 2019).

Although both sister species are extinct, they left traces of their genetic markings in Modern Humans, who interbred with them at some point of their dispersal out of Africa (Teixeira, and Cooper 2019; Vernot and Akey 2015).

In addition to the above-mentioned *naledi,* there is also *H. floresiensis*, discovered in 2003. Nicknamed the 'hobbit,' *H. floresiensis* was small (3'7", 1.09 m), used fire and advanced stone tools (Sutikna, Tocheri, Jatmiko, Awe, *et al.* 2018).

Anatomically Modern Humans

Anatomically Modern Humans (AMH) refers to existing humans, who, based on genetic and archaeological evidence, are thought to have evolved in Africa, interbreeding as they dispersed with other receding sister species, such as the Neanderthals and Denisovans. Although the exact time and place of emergence of AMH is undetermined due to scarcity of the fossil record and chronological uncertainty of many key specimens, both genetics and fossil evidence point to Africa for their origin (Stringer 2016; Hublin, Ben-Ncer, Bailey, Freidline, *et al.* 2017; Howells 1993; Deacon 1994). Some of the earliest known fossils of anatomically moderns include Jebel Irhoud (Morocco), dated about 300 ka. Omo-Kibish I (Ethipia), originally dated to about 190 Ka, but later adjusted to about 233 ka (Vidal, Lane, Asrat, Barfod, *et al.* 2022), and Florisbad (South Africa), dating to about 259 ka. Later fossils of moderns come from Klasies River Mouth Cave and Border Cave (South Africa), Qafzeh and Skhul (Israel) and Dar es-Sultan (Morocco) (see McDougall, Brown, and Fleagle 2008; Stringer 2016; Howells 1993; Tattersall 1995; Deacon 1994).

Anatomically Modern Humans in the Maghreb

There is no fossil evidence of early hominins in the Maghreb. Geographically, the nearest Australopithecine to the Maghreb is *Au. Bahrelghazali*, found at Bahr el-Ghazal, Chad, dating to about 3-3.5 Mya (Brunet, Beauvilain, Coppens, Heintz, *et al.* 1995, 274). This discovery, however, shows that the Maghreb is theoretically within the geographical range of the earliest known *afarensis* species (Shreeve 1996, 116). Although present day Sahara is a barrier to faunal and floral exchange, it is established that it underwent many greening periods (GSPs) in the past, resulting from changes in monsoonal patterns. According to studies based on continental paleoenvironment (lacustrine, perilacustrine and eolian sedimentary evidence), there have been over 230 GSPs in the Sahara within the last 8 million years, with periods lasting between 4 to 8 ka (Larrasoaña, Roberts, and Rohling 2013). Causing expansion and contraction of tropical and subtropical vegetation, these paleoenvironmental conditions are favorable for the dispersal of hominins and other large mammals. They also create 'frequent connection between East and Northwest African mammal faunas and recurrent hominin occupation of the Sahara' (Ibid.).

It is these environmental conditions that seem to explain the early arrival of hominins into the Maghreb, which is archaeologically documented in the presence of pre-Acheulean, or Oldowan tools. Named after the toponymic place in Tanzania, and referred to sometimes as Karari, these are flaked and roughly spherical stones with jagged edges (*galets aménagés*) (see chapter two).

The presence of what was initially thought to be *Homo erectus* in the Maghreb was first attested at Tighenif (Ternifine), near Oran, Algeria, where three mandibles, a skull fragment, and teeth were found by C. Arambourg in 1954. These specimens have been dated to at least 700 ka (Clark 1994, 456; Jaeger 1976, 178). There are indications that the age of the Tighenif tools was underestimated; they may be much older (Muttoni, Lefèvre, Degeai, Geraads, *et al.* 2021). Elsewhere, signs of butchering—bones with cutmarks and stone tools found at Boucherit, Algeria—seem to push the North African ancestry to about around 2.4 million years ago (Sahnouni, Parés, Duval, Cáceres, *et al.* 2019; Genochio, Mazurier, Dumoncel, Theye, *et al.* 2019).

It is unclear whether present day 'modern' morphology appeared punctuationally or gradually among the Middle Stone Age (MSA) ancestral *H. sapiens,* but there is a continuity, even likely local evolution, of the hominid lineage in the Maghreb. This is supported by the presence in this region of transitional, near modern, and modern human fossils (Howells 1993, 157, Jaeger 1976, 184). Recent analyses of the inner morphological structures of the permanent teeth of the Tighenif fossils suggest that the Middle Pleistocene North African may belong to the ancestral group, or Last Common Ancestral to the Neanderthal, Denisovan and modern human (Zanolli and Arnaud 2013; Stringer 2016).

The transition to near modern or archaic *H. sapiens* in the Maghreb is indicated by a series of fossil finds dating back to the MSA. At Jebel Irhoud, human remains consisting of an adult cranium, (Irhoud 1), an adult calvaria (Irhoud 2), and a juvenile mandible (Irhoud 3), were discovered respectively in 1961, 1963, and 1968. These were initially recovered, along with Mousterian artefacts, but without full documentation. However, in 1969, a juvenile humerus (Irhoud 4) was recovered under controlled excavations. This was followed by the discovery of a hip fragment (Irhoud 5). These finds were associated with abundant faunal remains and Levallois stone-tool technology that was initially given recent dates (Hublin 1993, 125; Howells 1993, 165). Later excavations between

2004 and 2009 led to the recovery *in situ* of archaeological material and remains of at least five individuals (three adults, one adolescent and one immature individual, around 7.5 years old). The thermoluminescence (TL) and newly established U-series/ESR led to redating the site to 315 ± 34 ka (Hublin Ben-Ncer, Bailey, Freidline, *et al.* 2017, 290). This date is earlier than other Middle Stone Age specimen from other parts of Africa (e.g., Gademotta, Ethiopia: before 275 ± 6 ka; Baringo, Kenya: before 284± 12 ka; and Kathu Pan layer 3: before 291 ± 45 ka) (Richter, Grün, Joannes-Boyau, Steele, *et al.* 2017, 296). Along with those of the South African Florisbad partial cranium, the Irhoud fossil hominins represent the earliest known representatives of the *H. sapiens* clade (Ibid.).

While they display a facial morphology that connect them to Early Modern Humans (EMH), the Irhoud fossils seem to have retained an overall primitive cranial shape (elongated and not globular braincase and endocast) that is unlike those of Recent Modern Humans (RMH). 'The Irhoud evidence supports a complex evolutionary history of H. sapiens involving the whole African continent' (Ibid.; Stinger 2016).

Excavating in 1975 at Dar es-Soltan II (near but different from Das es-Soltan I), André Debénath unearthed human remains consisting of a partial adult skull, a child's skull, two parietal mandibles and teeth, a cranial vault with more complete, modern looking, and upper and lower jaws (Debénath 1976; Klein 1989, 233; Hublin 1985, 284; Stringer 2016; Oujaa, Arnaud, Bardey-Vaillant, and Grimaud-Hervé 2017). Fragmentary human remains also came from the caves of El-Aliya (a large maxilla and teeth), and Témara (vault fragments, lacking a supraorbital torus and a mandible). They were found in Aterian contexts and belong to modern *H. sapiens* (Stringer 20167). In 1977, a mandible and an isolated canine tooth were found in Zouhra Cave at El Harhoura, between Dar es-Soltan and Grotte des Contrebandiers (Stringer 2016; Hublin, Verna, Bailey, Smith, *et al.* 2012).

Elsewhere in the Maghreb, a tooth and two lower jaw pieces with no evidence of retromolar spaces were found at Haua Fteah, Libya. They were initially dated to about 47 ka, but recent assessment of the finds estimated it to be about 70 ka (Stringer 2016).

Significant is also the antiquity of ornamental objects (beads) associated with early AMH in the Maghreb (Bouzouggar, Nick Barton, Vanhaeren, d'Errico, *et al.* 2007; Bouzouggar, Humphrey, Barton, Parfitt, *et al.* 2018; Vanhaeren, d'Errico, Stringer, James, *et al.* 2006).

Aterian and Mechta Afalou (Machtoid) People

From the preceding, it appears that Irhoud was succeeded by Dar es-Sultan 2 and Témara, both anatomically moderns and associated with the Aterian industry (Debénath 1992, 712; Hublin 1993, 118). These Aterian people show a robusticity (supraorbital relief, a broad braincase and megadonty, or large teeth), which is also typical of the Mechta Afalou (hereafter Afalou), the people who inhabited the Maghreb during the Aterian-Iberomaurusian times (*infra*).

Named after Mechta Afalou-Bou-Rhummel near Bejaia, these people are tall (averaging about 1.72 meters) and robust, with large and long crania (over 1600 cc for males). They have marked temporal lines, short, broad faces, and mandibles on the heavy side (Petit-Maire and Dutour 1987, 277; Camps 1974, 81). Fossil remains found at Taforalt (Morocco), Mechta el-Arbi, and Columnata (Algeria) show Afalou to be morphologically related to the Aterians (Férembach 1985, 395; Debénath 1992, 714). Aside from a slight difference in robusticity, there are no signs of any anatomical discontinuity between Afalou and the older but anatomically modern people of Dar es-Sultan and Mugharet el-Aliya, or even the Irhoud people (Hublin 1993, 127; Férembach 1985, 395, Jaeger 1976, 184).

Interestingly, the people of Nazlet Khater 4 (Egypt) are also thought to be anatomically related to the Afalou (Debénath 1992, 714; Vermeersch, Paulissen, Gijselings, Otte, *et al.,* 1984, 242).

The Afalou people persisted throughout the Iberomaurusian period (*infra*) and may have become widespread in the Maghreb and the Sahara. Though it is not a settled question, some researchers think that remains from Wadi Halfa in Sudan dating to about 12 ka show that the Nile Valley population may be related to Afalou (Clark 1987, 5;

Petit-Maire and Dutour 1987, 259, specially 277). Similar views have been put forward concerning Mechtoid remains in northern Mali, at Hassi el Abiod, and on the Atlantic coast of the Sahara dating from 7000 BP to 4500 BP (Petit-Maire 1993, 413; 1988, 22, Petit-Maire and Dutour 1987, 271; Raimbault 1993, 417). Other Mechtoid remains are thought to be the Guanches, who inhabited the Canary Islands at least since 2500 BC (Onrubia-Pintado 1992, 1737).

Capsian People

Keeping in mind the fact that there is no correlation between lithic cultures and different types of people (Marks 1990, 68), nor is there any wide correspondence by area, or with known types of people (Howells 1993, 120), a new and different industry known as the Capsian appeared in the Maghreb during the tenth millennium before the present. The (Early) Upper Capsian is found in the Central Maghreb, from southern Tunisia to western Algeria (Tiaret) and south to Ain Naga (Djelfa). The earliest Upper Capsian site is dated to 9350 BP at Ain Naga (El Djelfa).

Being less robust, more contemporary-looking (gracile) than the Afalou, the early Capsians were initially described as Proto-Mediterranean. This classification, however, was based on erroneous methods, which did not account for geographical and historical separations; nor did it correct for sexual dimorphism, which seems to have been ‘marked in the earlier [Afalou] populations and decrease[d] through time’ (Lubell, Sheppard, and Jackes 1984, 162, also Lubell 1984; Sheppard and Lubell1990). Remains from Mejdez II (Setif) indicate close contacts between the Capsians and the Afalou who occupied the rest of the Maghreb and the Sahara. The Capsian people seem to have led a semi-settled life around water sources (see chapter two). As indicated by the many impressive mounds of snail shells (*escargotière* locally called *rammadiya* in reference to their ash content), snails constituted a major part of the early Capsian diet (Balout 1955, 392).

The Afalou and the Capsians buried their dead (Grébénart 1992, 1763), sometimes accompanied with offerings as indicated by few objects found at burial sites. Both Afalou and Capsians also practiced dental ablation, or removal of upper incisors (Camps 1974, 170).

As to their origin, there are those who, like L. Balout, favor an African origin of the Capsian (Balout 1955, 416-17), and others who favor a Near Eastern origin on account of some similarities between the Capsian and the Natufian of the Levant (Camps 1974, 193; Aumassip 1991).

Genomic research and AMH in the Maghreb

Theoretically, Irhoud occupies a respectable position in relation to the rise and spread of AMH, the structure of their lineages, and their dispersals out of Africa. Despite the scarcity of North African middle Pleistocene fossils, the Irhoud has in Tighenif a solid link to the archaic roots of *H. sapiens*, while Dar es Soltan, el-Alya and Témara provide it with the potential for continuity through the Aterian, Mechta Afalou, and present-day populations. Geographically, this continuity of the Irhoud lineage is consistent with the relative insularity of North Africa, which the Sahara and two seas provide.

Ironically, it is this insularity that raises questions regarding possible contribution of North Africa to the ancestral human lineages, dispersals out of Africa, and the processes of diversification. Until recently, there has a tendency in paleoanthropological studies to focus on eastern Africa and Levant as a geographical and chronological bridge in the human evolution, while reducing the Maghreb components to a ‘dead end’ (Klein 2008; Mounier and Lahr 2019). Some diffusionist views in recent genetic studies seem to locate the origin of North African people in the Upper Paleolithic populations of Europe and the Levant. But all this may simply reflect the paucity of archeological finds, the inadequacy research techniques in North Africa, as well as the intellectual reflexes that excluded Irhoud form the AMH evolutionary picture for a long time. But there are no reasons for excluding the existence of a distinctly native genetic component in the Maghreb, or possible contribution to the disbursal of AMH out of Africa.

It is true that the genetic structure of present-day North Africa shows a complex demographics characterized by admixture and drift (Lucas-Sánchez, Serradell, and Comas 2021; Pereira, Silva, Franco-Duarte, Fernandes, *et al.* 2010; Henn, Botigué, Gravel, Wang *et al.* 2012; Scerri, Drake, Jennings and Groucutt 2004; Fregel, Méndez, Bokbot, Martín-Socas, *et al.* 2018). Yet, 'Despite the continuous gene flow from the Middle East, Europe and sub-Saharan Africa, an autochthonous genetic component dating back to pre-Holocene times is still present in North African groups' (Lucas-Sánchez, Serradell, and Comas 2021). The indigenous North African ancestry is more frequent in Amazigh (Berber) populations. There is also a gradient of likely autochthonous Maghrebi ancestry that increases from east to west across northern Africa (Henn, Botigué, Gravel, Wang *et al.* 2012).

Genetically, present-day modern humans trace their lineages to populations that lived in Africa, sharing their most recent common ancestor (MRCA) mitochondrial haplogroups (mtDNA)–genetic structures, or single nucleotide polymorphism (SNP), transmitted through mothers. One of the deepest mtDNA haplogroup is L, which is thought to have coalesced around 190 ka, and which gave rise to two branches, L1 in east African and L0 in southern Africa.[1] While L0 remained confined to southern Africa, the eastern branch diversified into L3, which is found in most ancient Africans and those who dispersed out of Africa ~70–60 ka. Another early haplogroup, M, is relatively younger than L3, having emerged sometime around or after the recent out-of-Africa migration event—it is not clear yet whether the mutations that define haplogroups M and N occurred in Africa before the exit from Africa or in Asia after the exit from Africa.

Analogous to mtDNA are the Y-DNA haplogroups SNP markers which human males carry in the Y-chromosome. All living humans trace their patrilineal lineage to a Y-DNA haplogroup found in the most recent common ancestor (Y-MRCA), which arose in Africa.

The oldest recovered genetic data in the Maghreb come from Taforalt (Grotte des Pigeons), dating to 15 ka. Attributed to the Iberomaurusian culture, the data show the presence of the mitochondrial haplogroup U6a in six individuals, and M1b

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[1] Where does this leave the 300-my-AHM Irhoud people cladistically is yet to be solved.

in one individual (van de Loosdrecht, Bouzouggar, Humphrey, Posth, *et al.* 2018). Having a founder age around 50 ka, haplogroup U is one of the oldest clades, which is thought to have appeared in western Asia. Its presence in Romania (Peştera Muierii-1) around 34 ka suggests, some researchers think, a western spread of population into South Asia, Europe, and the Near Est during the Early Upper Paleolithic, and a back-migration into North Africa where it diversified into U6 form (Hervella, Svensson, Alberdi, Gunther, et al 2016; Larruga, Marrero, Abu-Amero, Golubenko, *et al.* 2017).

Based on the presence in North Africa of various subclades of haplogroup U, some have concluded that North Africans derive mainly from an early Eurasian 'back to Africa' that took place between 40 and 12 ka (Pereira, Silva, Franco-Duarte, Fernandes, *et al.* 2010). Inference was also drawn for a genetic affinity between the North African populations and the early Levantine Natufians (van de Loosdrecht, Bouzouggar, Humphrey, Posth, *et al.* 2018; Kefi, Hsouna, Ben Halim, Lasram, *et al.* 2015). But analysis of autosomal DNA using modern populations as a reference also found that the ancient Natufian samples harbored about 6.8% of a distinct African ancestry component, which is common among modern Omotic. This genetic distribution, some thought, may be associated with the spread of Proto-Afroasiatic and the specific Y-haplogroup sublineage E-M215—also known as E1b1b, which is found at higher frequency among the Iberomaurusian Taforalt sample.

That there had been a gene flow from Paleolithic Eurasia to Late Pleistocene North Africans is undeniable. Such an event is evident in the presence in a segment of North African populations of a level of Neanderthal DNA similar to South Europeans and West Asians (Sánchez-Quinto, Botigué, Civit, Arenas, *et al.* 2012). Indeed, studies on the retrogression of Neanderthal DNA in modern human lineages indicate that non-Africans inherited 1–4% of their genomes from this sister species but the Africans have no sign of Neanderthal DNA (Reich *et al.* 2010; Green, Krause, Briggs, Maricic, *et al.* 2010). However, subsequent research found that Neanderthal genes are present in north Africans (Sánchez-Quinto, Botigué, Civit, Arenas, *et al.* 2012; Henn, Botigué, Gravel, Wang *et al.* 2012). Significantly, Neanderthal genetic traces are higher in autochthonous populations with local, pre-Neolithic North African ancestry, such as the Berber populations of Tunisia. This, it was hypothesized, may be due to a pre-Holocene back-to-Africa movement, which may or may not be the case.

Concluding Remarks

Tracing mtDNA haplogroups U6 and L3 and its M and N derivatives are based on many assumptions regarding the distribution of these markers in Africa and the timing of their dispersal out of Africa. The general assumption is that these markers originated in east Africa and Eurasia. Consequently, not only is North Africa excluded from any contribution to the Out of Africa disbursal, but its ancestral population is supplanted by Sub-Saharan, Near Eastern, and Iberian populations. This assumption is not consistent with the antiquity of the AMH in the Maghreb, its record of the earliest appearance of symbolic behaviorand the geographic spread of the Aterian culture (Bouzouggar, Humphrey, Barton, Parfitt, *et al.* 2018; Doerschner, Fitzsimmons, Ditchfield, McLaren, *et al.* 2016; Bouzouggar, Nick Barton, Vanhaeren, d'Errico, *et al.* 2007; Vanhaeren, d'Errico, Stringer, James, *et al.* 2006). The paleoanthropology of North Africa clearly suggests the continuity of an evolutionary lineage that connects the middle Pleistocene Ternifine, the pre-Aterian Ihroud, the Aterian, the Mechta Afalou, and the Capsian people. Given the state of technology and conditions of research in North Africa today, it is not possible to reconstruct the genetic makeup of the ancestral Aterians. However, the possibility of the Aterians being the source of a founding lineage of one of the dispersals in and out of Africa should not be excluded. It is conceivable that one of the early out-of-Africa gene pools was totally or predominantly North African, which disbursed into Eurasia and around the Mediterranean. This would eliminate the need for replacement which is assumed in many genetic models (see chapter two). It will also explain many of the morphological similarities across the Mediterranean.

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