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Looking for the Origin of Modernity

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There is no direct, constant relationship between the anthropological and cultural aspects of modernity. Anthropologically modern peoples display a certain heterogeneity that is not unconnected with earlier peoples, and the culture produced by modern humans, which is also heterogeneous, is differentiated diachronically and according to territory.

Though paleogenetic research seems to point us to a single, African source for modern peoples, who had replaced the pre-*sapiens* populations in Eurasia, this view is not completely proven or accepted. On the other hand paleogenetic research has contributed to our relinquishing the hypothesis of a multiregional 'total continuity' of local pre-modern populations in the Old World. Indeed the theory of a partial replacement, by a migration 'out of Africa', appears to be getting increasingly plausible. This theory implies exchanges, both genetic and cultural, between pre-modern and modern populations.

Anthropological aspects

Finds of human fossil remains show that the most ancient specimens of modern humans come from southern Africa (110–90,000 years ago), central and eastern Africa (160–130,000 BP) and probably North Africa (160–130,000?). The modern humans of the Near East are a bit more recent but their taxonomic 'modernity' is disputed at different levels (Tillier, this issue). In the Near East the earliest coexistence between modern peoples and Neanderthals can be found over a period between 60 and 40,000 BP.

Contrary to what is observed in Africa and the Near East, modern peoples arrived in Europe relatively late, between 45,000 and 35,000 BP. There they encountered Neanderthals, with whom they coexisted for a period whose duration is variously estimated – from a few millennia up to more than 10,000 years – because it is difficult to establish a precise chronology for the period. Regardless of this, we can

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assume a biological and cultural interaction between Neanderthals and modern humans. And the Neanderthals' disappearance is likely to have been later in certain refuge areas: the south of the Iberian peninsula, the north Balkans and the Crimea (d'Errico and Sanchez Goñi, 2003; Jöris et al., 2003).

Given that Neanderthal presence is attested only in the western part of western Eurasia, the pre-modern populations of southern and western Asia would therefore have descended rather from *Homo erectus*. According to some authors these peoples, who are called 'archaic modern' (this is the case for Dali and de Mapa in China, dated to between 180,000 and 120,000) and come directly from the *Homo erectus* line, may possibly have evolved towards dwarf forms (cf. *Homo floresensis*) up to 18,000 BP.

Independently of local populations derived from *Homo erectus*, the southeast and probably the east of Asia witnessed the emergence, around 40,000 (60,000?), of modern forms, most likely of African origin, as in Australia (Mungo). Very little is known about biological and cultural interactions between these different populations (whose taxonomic position is still ill-defined), especially as in the cultural area there are few manifestations of 'modernity' in eastern and southeastern Asia.

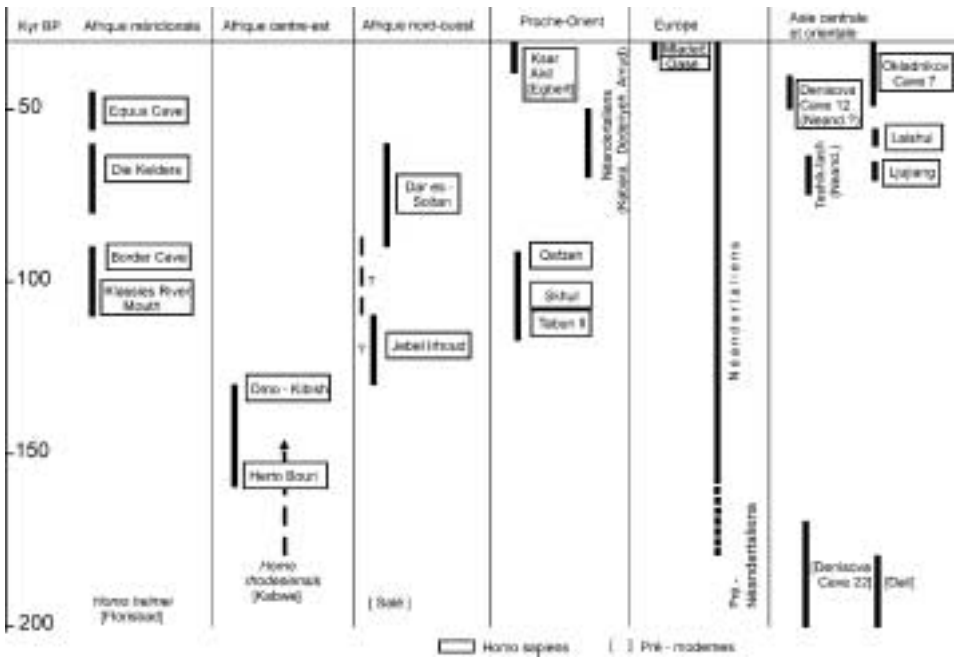

Fig. 1. Chronological position of anatomically modern compared with pre-modern forms (including Neanderthals) in the various parts of the Old World. Persistence of forms descended from *Homo erectus* in southeast Asia is taken into account (including *Homo floresensis*)

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Paleogenetic approach

As has been said, data from genetic research, both on mitochondrial DNA and partially on the Y chromosome, have been used as a fundamental argument against the multiregional origin of modern humans, strengthening the hypothesis of a fresh migration (third wave) of these peoples from Africa (Serre et al., 2004). This theory of a total replacement, based on the differentiation between the lines of present-day populations worldwide, has been backed up by DNA analysis of Neanderthal fossil remains, which are seen as different from all the lines of present-day populations. However, several questions remain as to the relationship between Neanderthal and modern lines (Weaver and Roseman, 2005), especially as certainty about the mitochondrial DNA of modern fossil populations contemporary with the last Neanderthals is practically non-existent, and the oldest fossil DNA, from the Gravettian burial at Paglicci and dated to around 25,000 BP (Giacobini, this issue), may be contaminated (Caramelli et al., 2003). Other finds are even more recent. So the phylogenetic development of present-day lines can be followed as far as 25,000 BP (Serre et al., 2004). If contact and cross-breeding with Neanderthals was indeed older, their contribution was all the greater (Cooper et al., 2004).

However, two points should be emphasized concerning the weakness of the paleogenetic arguments. The first has to do with the matter of the reconstruction of the 'phylogenetic tree' of Eurasian haplogroups, which is not always based on all the sequences of mitochondrial DNA, and their connections with the Asian and European population routes. It is particularly hard to define the links between the haplogroups of southwest and south Asia and the typically European groups such as H, I, U (Forster, 2004; Herrnstadt et al., 2002), whose age is probably not earlier than the Gravettian (25,000 BP).

A second problem is raised by the 'paleogenetic clock', the dating of the appearance and spread of phylogenetic groups with reference to simple demographic models whose chronology is often calibrated based on archaeological data. Here we have a vicious circle. In addition it has been proved that one and the same haplogroup might have evolved and become differentiated at unequal speeds (Torroni et al., 2001).

The hypothesis of the entire extinction of the Neanderthal line is not accepted unanimously by paleoanthropologists. Some fossil remains of modern humans, for instance the Aurignacian remains at Mladeč in Moravia, dated to about 34–32,000 (Wild et al., 2005), one of the individuals in the Streletskaya–Soungir culture burial in Russia (Alekseyeva, 2000), dated to about 28,000 and even the child from the Gravettian burial at Lagar Velho in Portugal, which is still more recent (about 22,000), display some primitive characteristics that are likely to be derived from Neanderthals (Trinkaus and Zilhão, 2002).

The question is thus still open as to the taxonomic status of modern and premodern populations, particularly Neanderthals: are the differences interspecific or intraspecific? Reconstruction of the 'phylogenetic tree' for modern populations is also full of holes, particularly as regards separation of haplogroups, the basis for their separation and the period when they appeared and/or migrated.

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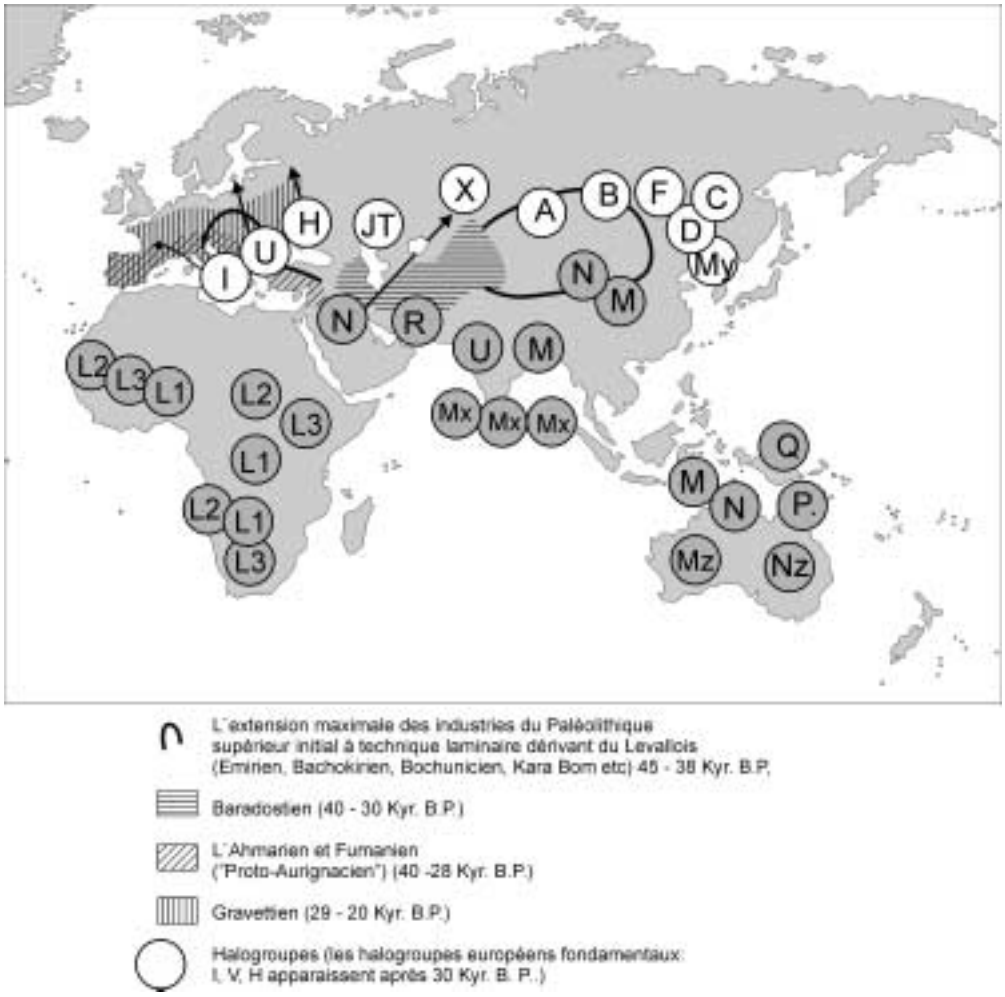

Fig. 2. Map of the dispersal of haplogroups according to mitochondrial DNA (after Forster, 2004) related to the geographical dispersal of the different cultural entities. In Europe only the Gravettian could correspond to the formation of the earliest haplogroups (after 30,000 BP)

Finally we need to stress the methodological risks associated with extracting DNA from fossil bones; if the results are too close to the DNA of present-day populations, there is a tendency to suspect contamination. The consequence of this critical approach, which otherwise is quite justified, is that no analysis of DNA from a pre-*sapiens* fossil which is close to that of a present-day human will be accepted unreservedly by specialists.

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In the last few years paleogenetic research has also been involved in learning about specific genes that are responsible for certain activities in the human brain, for instance the MCPH1 gene (microcephalin), which regulates brain volume (Evans et al., 2005). Studying it may help us learn about regional variations in 'brain-related' phenotypes. Another example is study of the mutation of the FOXP2 gene, which is responsible for some aspects of articulated language and grammatical structure (Enard et al., 2002).

Paleoenvironmental approach

The influence of the natural environment, chiefly adaptive processes, on humans' biological and cultural evolution is widely accepted. In this regard there is general agreement about a relationship between the appearance and spread of modern humans and climatic events with a general scope. The most ancient paleoanthropological remains of modern humans in Africa are dated to between 180 and 160,000 BP, which in terms of climatic evolution corresponds to the beginning of isotopic stage 6 (MIS 6). That period was also marked on the continent by important technological innovations (Barham, 2002), which we refer to in the next paragraph. From the paleoclimatic point of view it was characterized by growing drought in northern Africa – generally coinciding with the glacial periods in Eurasia – which is also visible in North Africa and the centre-east, where the rate of accumulation of windborne grains of quartz on the sea bottom reached its maximum before 140,000 BP (Thiede et al., 1982). After the MIS 6 stage conditions became much wetter, especially around 130,000, 103,000 and 80,000, as recorded by the palynological diagrams corresponding to the MIS 5e, 5c and 5a stages (Lezine, 1991). It is therefore justifiable to assume that modern features appeared in a dry, colder period and that they are a sign of adaptation to harsher ecological conditions.

On the other hand, the time of modern humans' first spread beyond Africa, which we can place between 120,000 and 90,000 BP, corresponds to climatic improvements that transformed the northeast of Africa into savannah dotted with many lakes in the present-day western desert, rich in large animals and also birds and fish (Kowalski et al., 1989). These conditions probably lasted until around 80–70,000 (Schild et al., 1992), followed by a long period of increasing aridity. Contrary to the change towards 'biological modernity' the spread of the first modern humans out of Africa would thus be connected to more favourable climatic conditions, which facilitated the occupation of the eastern Mediterranean.

In the Near East temperate wet conditions correspond to the MIS 5e stage during which the beaches at Enfean II (Lebanon) were formed, on which were superimposed the strata containing industries of the Tabun C type, contemporary with the first modern humans (Copeland and Moloney, 1998). Later, when modern humans settled in the Near East, we see a worsening of climate corresponding to the MIS 4 stage, which resulted in the arid bands around the eastern Mediterranean getting wider. It was only at the start of stage 3, after 50,000 BP, that wetter conditions returned, while remaining quite cold (Goldberg, 1986).

The spread of modern humans towards Europe corresponds to the start of the MIS

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3 stage, that is, a period of climatic instability especially well marked by the isotopic curves in the north Atlantic and Greenland. For the period between 45 and 35,000 BP we can distinguish at least six cold stages (GS 13–8), separated by 5 interstadial periods (GI 12–8) (Stuiver and Grootes, 2000), labelled 'Dansgaard–Oeschger phases'. In addition we see abrupt changes corresponding to 'Heinrich events' 5, 4, 3, marked by paleoclimatic deterioration recorded in bores from the Atlantic by remains of polar foraminiferae and very different from the periods of climatic improvement. We should note especially the opposition between 'Heinrich 4' and the subsequent improvement known as GI 8; superimposed on these climatic phenomena are violent volcanic eruptions in central Italy which produced the deposits of tephra[1] (Campanian ignimbrite) throughout the southeast and east of Europe around 40,000 BP. These phenomena had a strong influence on living conditions in Europe and were the cause of movements of population and demographic variations (Giaccio et al., 2006).

Paleogeographic and paleophytological maps detail the position of these climatic variations. For the temperate phases ('warm type d/o events': Huntley and Allen, 2003) the palynological data suggest a patchwork of environments subdivided on north–south and east–west axes; the cold phases ('cold type d/o events') are distributed in latitudinal bands: steppe in the south, steppe-tundra in mid Europe and polar desert on the Great Plain of northern Europe.

The MIS 3 stage paleoclimatic variations, which were marked by quite abrupt changes, allow us to imagine a complex scenario where the last Neanderthals were replaced by modern humans. Several impulses affected the patchwork of modern humans' environments during the climatic improvements and reduced the areas occupied by Neanderthals to refuges during the cold phases. The different strategies for exploiting the natural environments used by modern humans and Neanderthals allowed the latter, regardless of the reduction in population volume, to continue in these refuge zones (for example southern Spain), which were of little interest to the modern peoples (d'Errico and Sanchez Goñi, 2003).

The impact of environmental conditions on the spread of modern humans into Asia is as yet too little known to be discussed here, as are the conditions under which pre-modern populations persisted on that continent.

Regardless of the importance of environmental conditions during the different stages of the spread of modern populations, we should probably agree with Mellars (2004), who stresses the fact that the impact of the environment alone cannot explain the profound differences between the behaviour of Neanderthal populations and that of modern humans in Europe.

Cultural approach

Replacement of pre-modern populations by anatomically modern humans coincides in general with the transition between the Middle Paleolithic, identified with pre-modern populations (Neanderthals in western Eurasia), and the Upper Paleolithic, which is assimilated with modern humans. This transitional phase was interpreted, in Europe at least, as the 'leptolithic revolution'.

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A large number of cultural features are commonly attributed to modern humans and considered as specific to the Upper Paleolithic. These features, which are widely referred to by Ofer Bar-Yosef (this issue), have to do with:

– technology;
– strategies for subsistence and exploiting territory;
– symbolic culture and art.

In the area of *technology* we should highlight:

– production of blade supports and growing standardization in the shapes of tools from the stone industry;
– use of animal material in the production of tools and hunting weapons;
– use of stone armatures to make composite tools and weapons.

In the area of *strategies for subsistence and exploiting territory*, we should note:

– growth in aquatic and vegetable foodstuff;
– appearance of equipment required for preparing food (grindstones, cutters, etc.) and roasting of grains;
– diversification in hunting strategies;
– the earliest forms of storage of food items;
– systematic spatial organization of sites according to different forms of activity;
– systematic supply of mineral raw materials, both local and from elsewhere, sometimes resulting in mining activity and implying networks of medium- and long-distance trade, which are also shown up by the search for certain types of mollusc.

In the area of *symbolic culture and art* we see:

– alongside possible body painting, the appearance of decorative objects, probably markers of the wearer's identity or signs of belonging to an ethnic group;
– appearance of figurative art, both portable and parietal, using different processes (engraving, painting and sculpture);
– presence of burials containing funeral furnishings, evidence of complex funeral rituals;
– appearance of the first musical instruments (flutes).

Not all these innovations appear at the same time; nor are they the exclusive attribute of paleoanthropological (biological) 'modernity'. In Africa we see that some of these innovations coincide with the emergence of anatomically modern humans, but others are earlier than modern populations; in all cases they appear gradually and are not like a 'revolution'. Among the innovations that go with the first modern humans in Africa, in the context of the 'Middle Stone Age' (partly equivalent to the Middle Paleolithic in western Eurasia), we should note, with McBrearty and Brooks (2000), the following characteristics.

– *Blade technology*, though in Africa it is earlier than the first modern humans (in the Kapthurin formation in Kenya the first blades appear well before 280,000: Tryon and McBrearty, 2002), and though some industries attributable to the first modern

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humans – for instance at Omo Kibish in Ethiopia – show use of Levallois technology associated with bifacial tools inherited from the Acheulean;
- *Use of mineral colorants*, probably for body painting, attested in Zambia and Kenya (Barham, 2002) before 280,000 BP, thus in the context of archaic *Homo sapiens*, whose grindstones required for grinding them appear well before 200,000 BP;
- *Extension of subsistence strategies* to fishing and collecting molluscs, which could have played an important part in the biological evolution of the brain, is confirmed among the first modern humans in Africa, especially in southern Africa between 140,000 and 90,000 BP, and similarly the making of bone weapons and tools is a typically African phenomenon (in eastern and southern Africa this type of object, particularly harpoons, is found between 80,000 and 70,000), whereas the first spears do not appear in Europe till around 40,000 and the first harpoons about 14,000 BP. We have also established that geometric microliths used as armature for projectiles and composite tools appear in Africa around 70,000 BP, some 40,000 years before any are found in Europe;
- In this respect, *abstract incised motifs* (are they notation systems?) attested in southern Africa between 90,000 and 100,000 BP, and *decorative objects* (perforated shells, ostrich egg beads) present in the same region between 60,000 and 40,000 BP, confirm the prior claims of Africa over Europe, unlike the figurative art painted on slabs, of which the oldest African evidence is no earlier than 28,000 BP (Apollo 11 cave in Namibia; Vogelsang, 1998).

And so in Africa innovations associated with 'modernity' are spread out in time over a period between 280,000 and 70,000 BP, during which archaic *Homo sapiens* evolved into the first anatomically modern humans. Apart from figurative art these innovations occur earlier than in Europe and come within the chronological frame of the 'Middle Stone Age' (MSA), which is not an exact equivalent of western Eurasia's Middle Paleolithic. The start of the MSA could correspond to that of the European Middle Paleolithic and from the technological viewpoint it represents a similar stage (bifaces, Levallois technique), but its final stage and the transition to the 'Late Stone Age' (LSA) are considerably later than the transition from the Middle to the Upper Paleolithic as seen in Europe. Chronologically and still more technologically (flake mode of production), the LSA would correspond rather to the Eurasian Epipaleolithic.

In the Near East we can also recognize some evidence of 'modernity' as being earlier than in Europe, though it is rarer than in Africa:

- the blade technique, which is very early in the Near East and goes back to 200–250,000 (for example the Hummalian in Syria); precedes the appearance of the first modern humans but does not figure among the technological repertoire of modern humans at Skhul and Qafzeh;
- bone work, which is quite late, as it is in Europe, occurs after 40,000;
- shafts for projectile points appear between 100,000 and 40,000, but it is hard to work out whether they are part of the context peculiar to modern humans and/or Neanderthals;
- structuring the floor of the houses and the hearth is found in the Near East before

100,000, but there too it is impossible to attribute it definitely to modern humans or Neanderthals (at Kebara it could be Neanderthal);
– incised geometric motifs appear around 90,000 in a context suggesting modern humans at Qafzeh; on the other hand at Quneitra around 60,000 BP (d'Errico et al., 2003) the incised lines are perhaps the work of Neanderthals;
– burials appear among both Neanderthals and modern humans;
– the first decorative objects – perforated shells – present in the Near East between 50,000 and 40,000 in a leptolithic context, are probably attributable to modern humans;
– figurative art is very rare but probably appears after 30,000 BP (incised pebble at Hayonim D).

In Europe certain cultural elements of 'modernity' appear among the Neanderthals: blade technology, techniques of fitting shafts to throwing weapons, long-distance supply networks for minerals, especially in central Europe, but not developing as intensively as the routes travelled in the Upper Paleolithic, functional structuring of sites, use of colorants, some rare cases of incisions or abstract motifs engraved on bone or stone, and a few decorative objects (Arcy-sur-Cure; d'Errico et al., 2003). This behaviour is the effect of the evolutionary dynamic peculiar to the Neanderthals, who sometimes adopted modern humans' habits only later, during the middle phase of the Upper Paleolithic (Kozlowski, 1990). However, the other signs of 'modernity' belong to modern humans, notably:

– development of bladelet techniques and use of composite tools;
– standardization of tools on a blade support;
– exploitation of vegetable resources by means of equipment adapted for the purpose (grindstones, fired-clay bowls for roasting grains);
– development of hunting strategies and diversification of methods according to the prey sought;
– storage of food;
– general use of objects for adorning the body (marked preference for teeth in mid-Europe and for shells in the south);
– quite differentiated figurative art (sculpture, engraving, painting);
– complex burials with funeral furnishings.

The presence of all these features is well attested in the leptolithic complexes whose formation is completed. We should also note that with the emergence of these features there appear distinct, territorially restricted taxonomic units which could correspond to ethnic entities.

The situation in southern and eastern Asia differs from the European position. Several innovations appear later or remain absent. In this respect the emergence of the blade and bladelet technique appears in a complex fashion in space and time:

– in central Asia, southern Siberia, Mongolia and northern China between 40,000 and 30,000 we find a blade production originating from the Levallois technical core, which was probably introduced from the Near East;
– the bladelet technique peculiar to East Asia – obtained from the Gobi type (wedge)

cores – does not appear until 30,000 BP; at Chaisi in the Fen Huang valley it dates back to 26,000 BP (Hou, 1998), at Xiachuan to 23–16,000 (Wang et al., 1978). Though some Chinese researchers attribute the origin of the technique to the very ancient tradition of Donguto-type cores belonging to the Lower Paleolithic (Hou, 2005), this theory does not seem to be justified, both for technological reasons and because of the unlikely cultural connection from the Middle to the Upper Pleistocene.

Furthermore we should also emphasize that making bone tools and weapons (including harpoons) does not appear till late on, for example at sites on the Xiaogushan plateaux (Huang et al., 1986), where the dating is probably between 23,000 and 16,000 (some authors suggest dates between 40,000 and 30,000). As for production of decorative objects (beads), AMS[2] dating places it between 27,000 and 34,000 BP in the upper cave at Zoukoudian (Huang, 2000).

All these innovations are later than the appearance of objects of adornment in parallel with blade industries derived from the central Asian Levallois technique. This is the case at Kara Bom, where pierced teeth as well as mineral colorants appear in layers 5–6 dated to between 43,000 and 38,000 BP (Derevianko and Rybin, 2005), and at the Denisova cave, where the beads and pendants made of hard animal material (bone, ivory, horse teeth), together with the needles with eyes and bone awls from layer 11, date from 37,000 BP (Derevianko and Shunkov, 2005). We should remember that the origin of these cultural groups from the Altai is probably attributable to a migration from the Near East.

Figurative art, a far more recent phenomenon, is thought to have appeared in southern Asia at the end of the Pleistocene or the start of the Holocene. In Australia we can assume the presence of a figurative and abstract art some millennia earlier than what we find in Europe (Lorblanchet, 1996), in a lithic technological context, which is quite 'primitive' and lacks the blade technique, which does not occur before the end of the glacial periods.

This analysis of the evidence for 'modernity' on the various continents leads us to state that there is not one single model for the formation of modern humans' culture. Without a doubt most of this evidence appears earlier in Africa, but following a developing process rather than an abrupt one, sometimes earlier than the emergence of modern humans. Outside of Africa both the chronological and the geographical order of the innovations is very diverse; some signs of 'modernity' can be put down to Neanderthals in western Eurasia, whereas the pre-modern populations of southern and eastern Asia do not show any 'modern' features, whether in material or in spiritual culture, with the possible exception of the polishing technique used in the production of some stone objects.

In the cultural domain, features of 'modernity' appear, sometimes sporadically during different periods, sometimes in a block that is a sign of the 'fully-fledged' Upper Paleolithic. We should also note that these features overlap with the limits of taxonomic entities, which are generally defined by their stone industries and the presence of 'indicative fossils'. The relationship between these taxonomic entities and paleoanthropological types is complex and seldom constant, with the possible exception of the Aurignacian. On the other hand the Moustero-Levalloisian in the

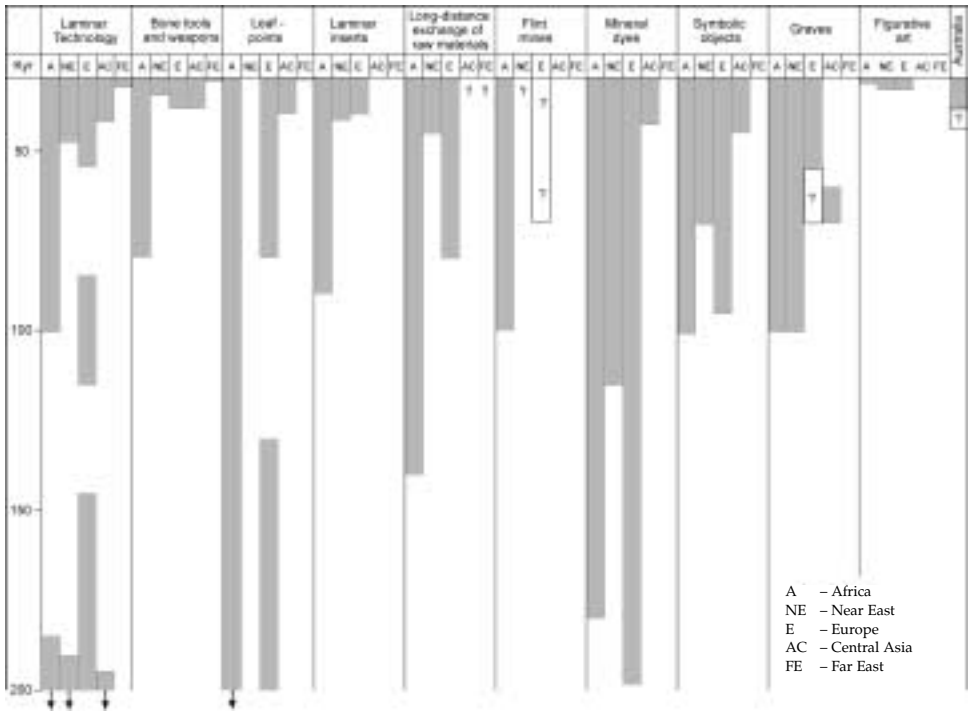

Fig. 3. Chronological diagram of the main innovations attributed to modern humans in the various parts of the Old World

Near East provides an example of a taxonomic entity corresponding to different paleoanthropological types: modern humans and Neanderthals.

The taxonomic entities contemporary with the period when modern humans replaced pre-modern forms are divided into four types:

1. The first type includes those coming directly from older entities that formed before the appearance of modern humans (for instance the Acheulean and certain industries from the African MSA, the Moustero-Levalloisian in the Near East, the worked pebble industries in southern Asia, the European Mousterian and Micoquian, etc.).
2. The second type brings together entities that reflect the developmental dynamic peculiar to pre-modern populations (for example the Neanderthals) outside Africa; in this case entities where some signs of modern cultural behaviour appear (for instance the Châtelperronian, Uluzzian, Szeletian, Streletskian, etc.), though in some cases they are exclusive to the Neanderthals. Their areas of occupation, which are restricted territorially, are known as 'transition industries', since some of them survived the Neanderthals' disappearance, but they played a part in the

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genesis of entities in the middle phase of the Upper Paleolithic (for example, the Streleskian evolved into the Soungirian, and the Szeletian probably contributed to the formation of the Gravettian).

3. The third type includes entities that appeared at the same time as modern humans, as an effect of an internal evolution of these cultural environments; this is the case with the blade industries derived from the Levallois technological core in the Near East during a period situated between 50,000 and 40,000. These entities, which were spread out over a vast geographical area, could be the result of the dispersal by migration of the first modern humans; so the blade industries originating from the Emirian, which represent the early Upper Paleolithic (Derevianko and Shunkov, 2005; Kozlowski, 2004; Otte and Kozlowski, 2001), might have reached the Balkans (Bachokirian) and central Europe (Bohunician) in the west, and central Asia in the east (Kara Bom and other similar industries).
4. The fourth type is represented by the block of 'modern' features attributed to the early Upper Paleolithic, such as the Baradostian in western Asia and Aurignacian in western Europe, which resulted both from the local development of the 'early Upper Paleolithic' and from a dispersal by migration of modern humans (see, for example, the links between the Ahmarian in the Near East and the Mediterranean Fumanian or Protoaurignacian). This problem (the 'new Aurignacian dispute', 1999–2000) is not resolved, since the lack of chronological precision for isotopic stage 3 does not allow us to trace the directions of the putative migrations.

These scenarios regarding the formation of the Eurasian Upper Paleolithic differ considerably from African internal evolution during the 'Middle Stone Age'. Nevertheless, within this evolution we can see several phyla and episodes, some characterized by older technical traditions (Acheulean, Levalloisian) and others (for instance the facies at Howiesons Poort) defined by the innovations associated with cultural 'modernity' (for example bladelet techniques, microliths, working with bone, objects of adornment, etc.). In Africa these innovations form a complete 'block' only in the 'Late Stone Age', thus relatively later than in western Eurasia.

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Notes

1. Tephra: a pyroclastic product composed of strips of lava (editor's note).
2. Accelerator Mass Spectrometer (editor's note).

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