

## Language and Modern Human Origins

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**ABSTRACT** The evolution of anatomically modern humans is frequently linked to the development of complex, symbolically based language. Language, functioning as a system of cognition and communication, is suggested to be the key behavior in later human evolution that isolated modern humans from their ancestors. Alternatively, other researchers view complex language as a much earlier hominid capacity, unrelated to the origin of anatomically modern *Homo sapiens*. The validity of either perspective is contingent upon how language is defined and how it can be identified in the paleoanthropological record. In this analysis, language is defined as a system with external aspects relating to speech production and internal aspects involving cognition and symbolism. The hypothesis that complex language was instrumental in modern human origins is then tested using data from the paleontological and archaeological records on brain volume and structure, vocal tract form, faunal assemblage composition, intra-site diversification, burial treatment, ornamentation and art. No data are found to support linking the origin of modern humans with the origin of complex language. Specifically, there are no data suggesting any major qualitative changes in language abilities corresponding with the 200,000–100,000 BP dates for modern *Homo sapiens* origins proposed by single origin models or the 40,000–30,000 BP period proposed as the time for the appearance of modern *Homo sapiens* in Western Europe. Instead, there appears to be archaeological and paleontological evidence for complex language capabilities beginning much earlier, with the evolution of the genus *Homo*.

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The evolution of language and its role in defining human uniqueness has always been a central question of paleoanthropological research. If living humans can indeed be distinguished from other organisms by language, then the origin of the human language system is of critical importance. But when did this system of language evolve, and what was the impact of language on human evolution? Did language emerge early in hominid evolution, or was it a later development? Much recent discussion is on the role of language in the origin of modern *Homo sapiens* and the development of modern human biological and behavioral diversity (cf. Aiello and Dunbar, 1993; Arensburg et al., 1990; Bickerton, 1988, 1990; Cavalli-Sforza, 1989, 1991; Cavalli-Sforza et al., 1988; Davidson, 1991; Davidson and Noble, 1989; Dibble, 1989; Duchin, 1990; Foster, 1990; Furth, 1991; Gibson, 1991; Houghton, 1993; Kendon, 1991; Klein, 1990, 1991; Koch, 1990; Lieberman, 1989, 1991, 1992a,b, 1993; Lieberman et al., 1992; Lindly and Clark, 1990; McCrone, 1991; Noble and Davidson, 1991; Renfrew, 1987; Snowdon, 1990; Tillier et al., 1992; Wind et al., 1992). The majority of these authors support the hypothesis that language, as it is structured today, developed late in human evolution and that it

is the critical factor leading to the evolution of anatomically modern *Homo sapiens*. Alternatively, others (cf. Arensburg et al., 1990; Tillier et al., 1992) suggest that language evolved at a much earlier stage in hominid evolution and played no significant role in modern human origins. In order to critically evaluate these conflicting views on language and modern human origins, it is necessary to first examine the concept of language itself and how it is viewed by paleoanthropologists.

Language as a concept in paleoanthropology has various definitions and uses. The concept of language can refer to the evolution of an all-encompassing system for conceiving of and communicating about the emotional and physical realms of human experience. Bickerton (1990) views language in this way, and regards it as the driving force behind brain evolution, serving as the structure and substance of thought and cognition as well as a system of communication. Language 'as we know it,' 'modern,' or 'complex' language as spoken today, has been defined as "regionally variable, symbolically-based, intra-specific *communication* that exhibits complex grammar and syntax and is phonemically based" (White, 1985:97; emphasis added). While most paleoanthropologists would acknowledge a fuller definition of language that includes aspects of both thinking and communication, in practice the simpler conception of language as communication is more commonplace. This is exemplified by the frequent confusion of the terms "language" and "speech" in everyday usage when referring to communicative aspects. In the following discussion, *language* will refer to an overall hominid system that has both internal and external aspects. The internal aspects include complex mapping and simulation of the world and consciousness (thought), while the external aspects include the expressions of the system shared between individuals in the form of gesture, vocalizations, or articulate speech (communication). *Speech* is therefore an external aspect of language that is symbolic in nature and produced by coordination of the brain and vocal apparatus. The term *complex language* or *modern language* will be used to differentiate present-day forms of language (with the linguistic structure of languages spoken by living peoples) from archaic language systems. There is little discussion about how archaic language systems might have formally differed from modern systems. Aside from a presumed fundamental difference in symbolic basis, archaic language systems may possibly have lacked syntactic structure and time reference (Bickerton, 1990), naming (Livingstone, 1973), or pronouns.

Two current lines of inquiry in language studies are the origins of modern languages using linguistic and archaeological reconstruction, and the biological and behavioral bases for the initial evolution of language. The latter studies address the importance of language as a conglomeration of cognitive skills, symbolic thought, and communication systems, and debate centers around how early those features of language developed and when critical stages in their use as a means of adaptation occurred. Both the language evolution and linguistic reconstruction studies have as their foundation the idea of a single origin and subsequent dispersal of behavioral innovations.

The model of a single origin is also applied to the evidence for the origin of modern humans, forming the backbone of the "Out of Africa" theory and other similar replacement hypotheses. According to these models, a behavior or behaviors that evolved first in a limited number of populations [for example, in sub-Saharan Africa between 200,000 and 100,000 BP (Brauer, 1989; Cann, 1988; Cann et al., 1987; Stoneking and Cann, 1989; Stringer and Andrews, 1988)] conferred a competitive advantage that resulted in the subsequent replacement of other hominids in the Middle East, Asia, and eventually Europe. What could be the key behavior(s) involved?

Many proponents of single origin models for the evolution of modern *Homo sapiens* view language (primarily complex language) as the most probable advantageous behavior behind the species' success. Washburn, in arguing for the replacement model, wrote: "suppose that the cause of the radiation of modern man

was language—language as we know it today. Then the radiation of modern man, the origin of language, and the acceleration of cultural change are all parts of the same complex of evolutionary events” (1981:231, see also Washburn, 1974). Krantz (1980:775) stated that “the *sapiens* transformation would make complete sense if it could be shown that the use of speech is correlated with the anatomical changes that occurred 40,000 years ago.” According to Cavalli-Sforza (1989:411), “the average modern human genotype would largely supplant earlier ones if it had individual and group selective advantage conferred by higher communication skills,” and “it also makes it easier to understand the rapid disappearance of Neanderthals, if they were biologically provided with speech of a more modest quality than modern humans” (Cavalli-Sforza et al., 1988:6006). J. D. Clark (1989:581) stated “my personal bias is that what made the Modern genotype so successful was the possession of a full language system, similar to our own.” Similar ideas are expressed in Foley (1991); Gamble (1980, 1982); Jaynes (1976); Klein (1989a,b); Lieberman (1988, 1989, 1991, 1992a); Soffer (1992); Whallon (1989); and White (1982, 1985, 1989a).

As these quotes illustrate, a powerful association has been made between the suggested origin and dispersal of languages from a single source and the origin and dispersal of populations of modern *Homo sapiens*. This link between modern language and modern human origins remains largely unquestioned and untested. Complex language is perceived as so fundamental to modern human societies, it is argued that it must have been present at the time of, or very early in, modern *sapiens* origins. Complex language is treated as an irrefutable factor in *sapiens* evolution. Given the underlying assumption that complex language is instrumental in the origin of modern humans, it is curious that the precise biological basis for the development of complex language is rarely discussed in paleoanthropology. Coon (1982) suggested that the capacity for complex language evolved by saltation from *Homo erectus* to *sapiens*. He argued for a doubling of the cortical surface area of the brain and the expansion of those surface areas associated with the organs of speech. More recently, Wilson (n.d.) proposed that modern mtDNA variants may provide the genetic basis for superior linguistic skills that enabled the descendants of mitochondrial Eve to replace other populations (see discussion in Brown, 1990). As no data are known to substantiate these hypotheses, neither has attracted much support from other researchers.

According to White (1985) and others, the major impact of the evolution of complex language was on social relationships. New language-based social systems with enhanced cooperation and leadership capacities (Burling, 1986), self-identification and naming (Livingstone, 1973, 1980), and strategic planning and the division of labor (Binford, 1985, 1987, 1989) would have enabled modern *Homo sapiens* to outcompete linguistically limited archaic populations. It is suggested that enhanced group identity [indicated by the development of art and symbolism in Europe (Conkey, 1978; Gamble, 1982; White, 1985)] and behavioral barriers would develop from linguistic differences, acting to isolate complex language speakers from other groups. There is little agreement about the timing of this complex language development—did it originate in some late *erectus* populations?, at the time of modern human origins, perhaps as early as 100,000 BP?, or sometime later but definitely by the appearance of Upper Paleolithic art?—but the proponents of single origin models cited above seem to agree that a fundamental shift in both language capabilities and the role of language in the formulation of society distinguishes anatomically modern *Homo sapiens* from their ancestors.

#### LANGUAGE AS HUMAN UNIQUENESS

While language has always held a central place in the list of uniquely human characteristics, it has become pivotal as other “human” attributes are slowly chiseled away from the block of humanity. Due to in-depth observations of primate behavior, the exclusively human domain is shrinking as previously described qualitative distinctions are being relegated to quantitative status. Once viewed as the

hallmark of humanity, tool use and hunting are now clearly primitive behaviors shared with other primates. Even "man the *stone* toolmaker" has arguably been usurped by Kanzi the bonobo (Toth et al., 1992). Similarly, warfare (Goodall, 1986) and politics (de Waal, 1982) are no longer restricted to our species.

Early paleoanthropological attempts to pinpoint or identify the time when modern human behaviors developed invoked the use of a "cerebral rubicon." The concept can be traced to the critical value of 750 cm<sup>3</sup> proposed by Keith (1948) to distinguish members of the genus *Homo* from anthropoids (in which he included the australopithecines). He proposed that a certain critical brain mass was required to achieve the suppression of instinct or impulses as seen in human mentality. Interestingly, Keith also linked the evolution of speech with the 750 cm<sup>3</sup> rubicon. He noted that pithecanthropines had crossed the cerebral rubicon because their mean cranial capacity was approximately 850 cm<sup>3</sup>. They were thus human-like in their mental and speech capacities. This concept of a rubicon is still very much in use, although its components have been decoupled and its meaning has been somewhat altered. Keith's notion of a discrete boundary for the evolution of the genus *Homo* is still applied, even though the use of numerical absolutes is now less common. A cerebral rubicon is used to distinguish *Homo habilis* from australopithecine grade individuals. But speech and language are being recast in the form of a new "linguistic rubicon" for the evolution of complex language that is used to isolate modern humans from their archaic ancestry (cf. White, 1985; Binford, 1987) despite paleoneurological evidence against a distinction between archaic *sapiens* and modern *sapiens* brains (cf. Holloway, 1985).

Ideas about human uniqueness have also been challenged by reinterpretations of the archaeological record. A refined understanding of hominid origins as well as the evolution of the genus *Homo* is changing our thinking about the process of sapienization, "uniquely human" attributes, and particularly language. At present, important distinctions are made between the moment of hominid origins, hominization or the evolution of the genus *Homo*, and sapienization, or the evolution of modern *sapiens*. The best, and perhaps single uncontested candidate for a feature critical to hominid origins is bipedalism. Aside from bipedalism, no other "uniquely hominid" behaviors are currently agreed upon. Those features previously associated with hominid origins or hominization [home bases, division of labor, language, strategic tool manufacture, hunting (Isaac, 1989)] are being scrutinized, with the result that many are now being associated with sapienization. According to this perspective, australopithecines may be hominids because they had bipedal capabilities, and not because they might have made stone tools. Binford (1985, 1989) views pre-*sapiens* tool use as opportunistic and expedient, akin to the tool-using traditions of chimpanzees. Tools were used to facilitate the hominid adaptation, but were largely peripheral to it. Other paleoanthropologists, who can be viewed as taking a more intermediate position on the issue of early hominid behavior, would attribute stone tool manufacture solely to members of the genus *Homo*. It is not surprising, then, to see reports of early *Homo* dates inching back toward the earliest stone tool dates (Hill et al., 1992). And according to the paleoneurology research of Falk (1980, 1983, 1987a,b), Holloway (1974, 1976, 1983) and Tobias (1987, 1991), the brain expansion and cortical reorganization first evident in *Homo habilis* endocasts is linked to language, handedness, and tool manufacture. All this suggests that some form of language capability and usage, certainly enhanced over that of non-human primates, had evolved by the late Pliocene. The question then remains, when did *complex language* evolve and when did it become critical to hominid adaptation? Are Binford and others correct in asserting that complex language abilities are linked to sapienization and consequently are of relatively recent origin? Are we human because we alone have *complex language*?

In theory, it should be possible to test the hypothesis that complex language was instrumental in the origin of modern humans. If the origin of modern *Homo sapiens* and the origin of complex language are intimately related, then evidence for

their nearly simultaneous development should be present in the paleontological and archaeological records. If complex language is unique to modern humans and is the basis for their ability to replace archaic populations such as the Neandertals, then there should be unquestionable evidence for the direct association of complex language exclusively with early modern *sapiens* populations. The evidence for complex language should be apparent at the time of modern *sapiens* origins and in the region where the change took place. In cladistic terminology, if complex language is the distinguishing characteristic of modern *Homo sapiens*, it should be present as an identifiable autapomorphy. Any evidence for complex language in earlier hominids such as *Homo erectus*, Neandertals, or other archaics would be evidence for continuity in complex language evolution and would argue against the hypothesis that the origin of complex language was the decisive factor in the replacement of archaic populations. Evidence for continuity in complex language would mean that the behavior was a synapomorphy, indicative of a shared derived condition for later members of the genus *Homo*.

In the following sections, I present a method for operationalizing the study of complex language evolution and evaluate the evidence for its first appearance in the fossil record.

#### OPERATIONALIZING THE STUDY OF COMPLEX LANGUAGE EVOLUTION

Complex language is such an all-encompassing phenomenon that the study of its origin may seem nearly impossible. Indeed, the study of language origins was outlawed by the *Societe de Linguistique de Paris* in 1865 as a safeguard against prolonged futile speculation (Kendon, 1991). Fortunately this philosophy has since been abandoned. More successful inquiry into both language and complex language origins is possible today because of a new source of data—paleoanthropological materials.

Yet the study of complex language evolution using paleoanthropological data is not without its complications. Foley (1991) has recently critiqued the use of “culture” in paleoanthropology. While he runs somewhat roughshod over the virtual “essence” of anthropology, he makes some insightful points about the use of a broadly defined concept as explanation that are applicable here. Culture, Foley argues, is often perceived by paleoanthropologists as the “adaptive niche” of hominids, a realm that places them apart, not only from other organisms but from other hominid species as well. For example, competitive exclusion was invoked to argue against speciation (Wolpoff, 1971), and co-evolutionary processes are thought to govern human behavior apart from biology (cf. Durham, 1991). Culture in these formulations “is an emergent property and a new evolutionary process” (Foley, 1991:27). As hominids became “culture-bearing” they rose above Darwinian aspects of evolution, because they were able to use culture to override many of the constraints imposed by biology and particularly natural selection. Culture becomes the uniquely human ability to shape the world rather than be entirely shaped by it.

Culture, then, has three basic flaws as a concept in palaeoanthropology: first, it is too high a level of abstraction to be of much empirical value; second, it assumes a permanent interrelationship of the components that constitute this high level of abstraction, an assumption that is invalid in evolutionary terms; and third, as the basic intention is to define something that is uniquely human, it is constantly redefined in the context of studies of nonhuman primates that show continuities between humans and nonhumans (Foley, 1991:29).

Foley’s comments on the use of culture in paleoanthropology are directly applicable to complex language. Like culture, complex language is generally conceptualized at too high a level of abstraction to be empirically useful. It is also a composite term, where the permanent interrelationship assumed between such aspects as symbolic thought, sequential planning, and speech makes it difficult to deter-

TABLE 1. *Categories of paleoanthropological data pertinent to complex language evolution*


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External aspects
Brain
Volume (cranial capacity)
Speech areas
Surface and hemisphere asymmetries
Vocal tract
Mandible
Cranial base
Hyoid
Internal aspects
Cognition
Brain volume and asymmetries
Faunal assemblage composition
Intrasite diversification
Lithic assemblage and raw material diversity <sup>a</sup>
Symbolism
Burial
Ornaments
Art

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<sup>a</sup>This category will not be evaluated here as it has recently been discussed in detail. The reader is referred to Chase (1991) Dibble and Mellars (1992); Hayden (1993); Mellars (1990); and Mellars and Stringer (1989).

mine whether those aspects evolved independently. Most importantly, the basic intention of using both the concept of culture and the concept of complex language in paleoanthropology is to identify human uniqueness. This is particularly true when the issue is the origin of modern humans. With regard to modern humans, the conception of complex language becomes virtually indistinguishable from culture, as modern humans are so dependent upon language.<sup>1</sup>

As defined above, modern complex language systems combine external features (principally the production of rapid, multitonal speech) with internal aspects of thought (complex mapping and simulation of the world and consciousness). An advantage of this dichotomy is that the internal and external aspects of language can be evaluated independently (Foley, 1991). Most paleoanthropological emphasis has been on the expression of the internal aspects, such as evidence for symbolic representation in art or other archaeologically observable phenomena suggestive of planning and cognition, although some research has focused on the external evidence such as the neural and vocal apparatuses related to the generation of speech. The different categories of paleoanthropological data that can be used to evaluate the evolution of complex language are presented in Table 1.

The categories in Table 1 are those that various authors have already proposed or investigated. Other criteria have been used; they are excluded here because they have been sufficiently discussed elsewhere or are more relevant to the investigation of the later manifestations of complex language than to its origins. An important issue that arises with the use of the selected variables is how well they represent evidence for complex languages of the past. As modern humans who can only project our present "speech dominated" simulations of the external world onto the past, we can only hope to find evidence for the origins of complex linguistic systems similar to our own. Alternative language structures and systems of symbolic thought undoubtedly remain unrecognized using these criteria, and may in fact precede the evolution of systems we can recognize.

While the evidence for each type of data will be evaluated independently in the following section, it is important to emphasize that many of these categories can-

<sup>1</sup>However, language and culture are not identical in modern humans. Language has become the overall, neurologically based system for adaptation in *Homo sapiens* and culture is the set of observable variants for the system. In other words, language is the structured framework for encountering the environment that is the product of natural selection, and culture is the varying expression of language.

not individually constitute evidence for complex language, but are only informative when they occur in conjunction with other data. This is most true of the evidence for speech production, which can be used to evaluate speech capability but obviously yields no information about the symbolic or cognitive nature of the communication.

#### PALEOANTHROPOLOGICAL EVIDENCE FOR THE ORIGIN OF COMPLEX LANGUAGE *External aspects*

The study of the external aspects of complex language involves analysis of the brain and the vocal tract. Limited to inference based upon fossilized aspects of the anatomy, paleoanthropologists have nevertheless devoted much energy to assessing the evidence for the evolution of complex language.

##### The brain

*Volume and cranial capacity* The notion that a critical brain volume is required for complex language can be traced back to Darwin's time. Since then, the comparative study of modern human cranial capacity variation has made clear the weak correlation between brain size and linguistic or cognitive competence within our species (cf. Gould, 1981; Molnar, 1992). For that reason, there is little recent discussion about the "minimum" brain size necessary for complex language. An interesting exception is Krantz's (1961) model, basically an elaboration of Keith's (1948) concept of the cerebral rubicon, that proposes a threshold of 750 cm<sup>3</sup> as the minimum necessary for human bodily needs plus an excess of neurons necessary for higher level mental functioning. Krantz suggests that *Homo erectus* children, born with brains smaller than 750 cm<sup>3</sup> were able to comprehend and use symbols only as their growing brains exceeded the threshold.

Assuming that there is a critical level of "surplus" or residual neurons needed for complex language [an issue as yet unresolved, but not necessarily implying an absolute threshold or rubicon (Falk, 1980)], then the evidence for complex language as measured by cranial capacity certainly precedes the origin of modern *sapiens*. Neandertals, other archaic *sapiens*, and the majority of *Homo erectus* cranial capacities fall within the modern range of variation (Molnar, 1992). The Neandertal mean, determined for a variety of different samples, actually exceeds the mean for modern human cranial capacity. Holloway (1985), who views the Neandertal brain as fully modern, explains the "excess" size of the Neandertal brain as a metabolic adaptation to cold environments and an allometric scaling effect due to higher lean body mass combined with a fully modern brain.

Aiello and Dunbar (1993) takes a slightly different approach to understanding the neural capacity for language in fossil hominids. They recently modeled the relationship among neocortex size, social group size, and level of social interaction (as measured by grooming) in a range of primate species. They found a close relationship between encephalization and group size, and from this suggest that the pressure for large group size in early hominids led to brain encephalization as well as the evolution of language, which replaced grooming as a more efficient way to maintain cohesion in a large social group (Dunbar, n.d., cited in Aiello and Dunbar, 1993). Applying the model to the hominid fossil record for brain size, Aiello and Dunbar propose that "the necessity for both large groups and (at least rudimentary) language appeared early in the evolution of the genus *Homo* and began to increase rapidly in the second half of the Middle Pleistocene. It [the model] provides no evidence for the relatively sudden appearance of a radically novel communication system in the Upper Palaeolithic (about 40,000 years ago)" (Aiello and Dunbar, 1993:184). Instead, the Aiello and Dunbar analysis suggests that modern symbolic language (i.e., complex language) was a gradual outgrowth of the language enhancement that began with the earliest members of the genus *Homo* approximately 2 million years ago.

*Structure; speech areas and asymmetries.* In light of the overwhelming evidence for large cranial volumes in Neandertals and other early hominids, it has been argued that it is not mere size, but the neural restructuring of the human brain and changes in the relative size of its components that are critical for speech. Deacon's (1990, 1992) research in comparative neurology suggests that the modern human brain is a primate brain that has been co-opted and extensively modified by language. The relative size of different brain regions and the organization of the neural circuitry have been considerably modified in humans. The prefrontal cortex is particularly expanded, and is estimated to be twice the predicted size for a primate brain of modern human proportion. Those areas relating to stereotypic vocalizations in primates are also altered, possibly accounting for the differences in primate and human stereotypic call systems (Deacon, 1990, 1992). Unfortunately language circuits do not fossilize, and it is debatable whether changes in brain organization can be assessed on endocranial casts, but Deacon (1992) argues that brain size disproportion changes can be used as an indicator of circuitry changes. He describes a hominid trend in brain size enlargement reflecting selection for the production of language that begins with *Homo habilis*. Furthermore, he concludes that "during the evolution of distinct lineages of *Homo sapiens*, including the neandertals and the period around the neolithic cultural revolution, selection on brain function did not produce any further major neurological changes. This timetable specifically excludes hypotheses that directly correlate the evolutionary appearance of language with the attainment of a 'modern' position of the larynx, and alternatively suggests that this may be at most a 'refinement' subsequent to the completion of the underlying neural circuitry capable of controlling speech" (Deacon, 1992:154).

Studies of language evolution based on fossil endocranial morphology focus on the form and position of specific language areas, and asymmetries in surface structures and general brain form that are directly or indirectly linked to language and manual dexterity (cf. Parker and Gibson, 1979; and discussion of asymmetries in Bradshaw, 1988). The initial studies of Neandertal endocranials described them as large with reduced frontal lobes and a simian-like position of the lunatic sulcus (Boule and Anthony, 1911). The more recent research on Neandertal endocranials, most pertinent to this evaluation of the evidence for complex language evolution, has been conducted by LeMay and Holloway. LeMay (1976) rejects Boule and Anthony's assessment of the La Chapelle-aux-Saints endocranial as "primitive" based upon her interpretation of the position of the Sylvian fissure, and suggests that there is evidence for asymmetry of the sort associated with hemispherical task specialization and handedness.

Holloway's (1981, 1985; Holloway and de La Coste-Lareymondie, 1982) study of a series of Neandertal endocranials found no essential differences in Broca's area (motor control of speech) or Wernicke's area (speech and symbolic comprehension) from modern humans, but Holloway is skeptical about the accuracy of identifying such structures using convolutional patterns on endocranials.<sup>2</sup> Like LeMay, Holloway does see clear evidence for asymmetries following the modern human petaloid pattern that has an extension of the left occipital lobe and right frontal lobe. Symap comparisons of Neandertal and modern human endocranials (stereoplotter images based upon the analysis of residuals after allometric correction) suggest no significant differences in the frontal lobes (Holloway 1985), especially in the area that Deacon (1992) contends would be most critical for speech evolution.

The present consensus of paleoneurological research on the external aspects of complex language suggests that the changes associated with speech began early in hominid evolution, beginning with *Homo habilis*. There is evidence for continuity in these neural developments from the earliest Pleistocene to the present, and no evidence to suggest any modern human autapomorphies.

<sup>2</sup>Gannon and Laitman (1993) recently reiterated this concern, and further argued that functional aspects of brain organization related to language *cannot* be discerned from endocranials.



## The vocal tract

*Mandible* Paleoanthropological studies on the fossil evidence or “stigmata” (Sphuler, 1977) for speech in anatomical regions other than the brain have met with limited success and a great deal of skepticism. The first studies focused on aspects of mandibular morphology. According to Keith (1916), the major adaptation for speech involved the broadening of the jaws and outward placement of symphyseal buttressing so that tongue mobility was enhanced. The presence/absence of genial tubercles, genial pits, and chins are therefore the key speech features discernable on fossils. Both Neandertals and modern humans exhibit changes from the ancestral or simian pattern, yet Neandertals lack a fully modern development of the chin and genial tubercles for attachment of the genio-glossus and genio-hyoid muscles. Vestigial genial pits, characteristic of Neandertal specimens like Spy, are also present in certain “primitive” humans, but were viewed by Keith (1916) as linking Neandertals with their simian ancestry rather than placing them within the realm of modern human speech capabilities.

A reconstruction of the Neandertal larynx based upon the Gibraltar skull and the Tabun mandible and vertebral column appears in Negus (1949). It is attributed to Keith (Sphuler, 1977), or Keith and Negus (Lieberman, 1984, 1989), but a careful reading of Negus suggests that Keith supplied him with drawings of the fossils and that the reconstruction is actually by Negus. It was apparently done very late in Keith's career (when he was in his 80s) and the only published illustration of the reconstruction appears in an appendix to Negus' (1949) seminal work on the comparative anatomy of the larynx, for which Keith wrote the foreword. The Neandertal is depicted as a morphological intermediate linking the gorilla, the Rhodesian skull (Broken Hill/Kabwe), and modern humans (Fig. 1). The drawings are extremely schematic, and show anatomical inaccuracies inconsistent with the morphology of the fossils. This is most evident for the Kabwe skull, which is joined with an ape-like mandible and orientation of the vertebral column. Both fossils have vertebral columns inconsistent with bipedal posture, reflecting Keith's (1916: 155) view that in Neandertals “the head is fixed to the neck . . . in much the same manner as in young anthropoid apes. . . . this particular poise of the Neanderthal head is related to the great development of the face and jaws.” The relative depths of the palates and mandibles are modeled on ape rather than human or known archaic *sapiens*/Neandertal morphology. No detailed explanation is given of how the tongue and larynx reconstructions were made. They appear to be based upon the aspects of mandibular morphology that Keith deemed important for speech, Negus' views that changes in the relative size and form of the tongue are important for determining the position and form of the larynx, and the notion that the fossils represent intermediate stages in the evolution of the human larynx. According to the figure caption,

the jaws have receded somewhat, and the tongue in its backward progress, has become slightly curved. The larynx thus lies at a lower level in relation to the base of the skull and the vertebral column than in the Apes. There is, however, no large pharyngeal resonator, as in modern man, in whom the jaws have still further receded but the tongue is still large; the larynx is thus forced to lie low in the neck. In this way a capacious pharynx comes into existence. The palate of Neanderthal Man was slightly larger than that of modern man. The gap between the palate and the epiglottis has increased during evolutionary changes to that of modern Man (Negus, 1949:196).

In contrast with later reconstructions discussed below, it is interesting to note that in the Negus reconstruction the Neandertal larynx is placed low in the neck relative to the vertebral column and cranial base.

For most early scholars (discussed in Dubrul and Reed, 1960, and Vallois, 1961),

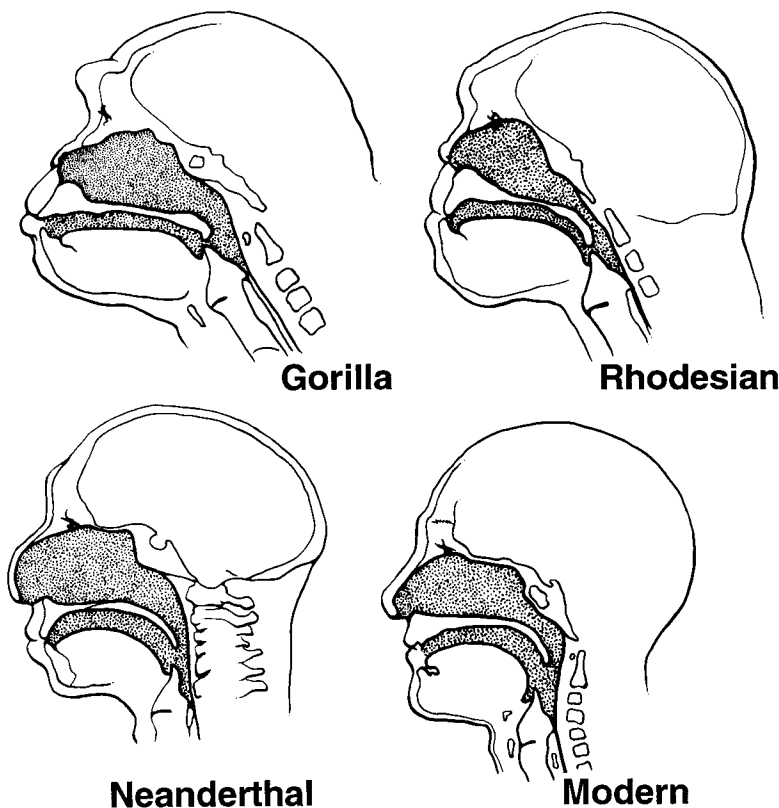


Fig. 1. Supralaryngeal vocal tract reconstructions from Negus (1949) showing a progression of vertebral column orientation and tongue contour from gorilla to modern *Homo sapiens*. The Neanderthal is a composite of the Gibraltar and Tabun females. Note the very low position of the Neanderthal larynx relative to the vertebral column. Redrawn from Negus (1949).

the presence of well developed genial tubercles was the most definitive evidence for articulate speech. But the validity of this criterion was eventually challenged. In his critique and rejection of this feature as a "stigmata" of speech, Vallois (1961; Boule and Vallois, 1957) remarked that the presence of genial tubercles on *Sinanthropus* mandibles would imply greater ability for speech at that time than was evident for the Mauer specimen and some Neandertals. In addition, he argued that the documented variability of genial tubercle development in living, speaking humans (cf. Hooten, 1946; Edgar, 1952, as cited in Vallois, 1961) made their use as paleontological indicators of speech futile. Dubrul and Reed (1960) and Vallois (1961, 1962) ultimately rejected all proposed anatomical indicators of speech, including endocranial cast morphology.

*Vocal tract reconstructions using the cranium and mandible.* Lieberman and Crelin (1971) reopened the discussion about fossil indicators of speech with their innovative investigations on the differences in vocal tract shape and position in modern humans, non-human primates, and fossil hominids. Typically, the human vocal tract is described as differing from that of apes and other primates in having a modified version of the standard mammalian two tube system that has separate tracts for the respiratory and digestive systems. In humans the tract is elongated and bent, resulting in a separation of the soft palate and the larynx and a crossing

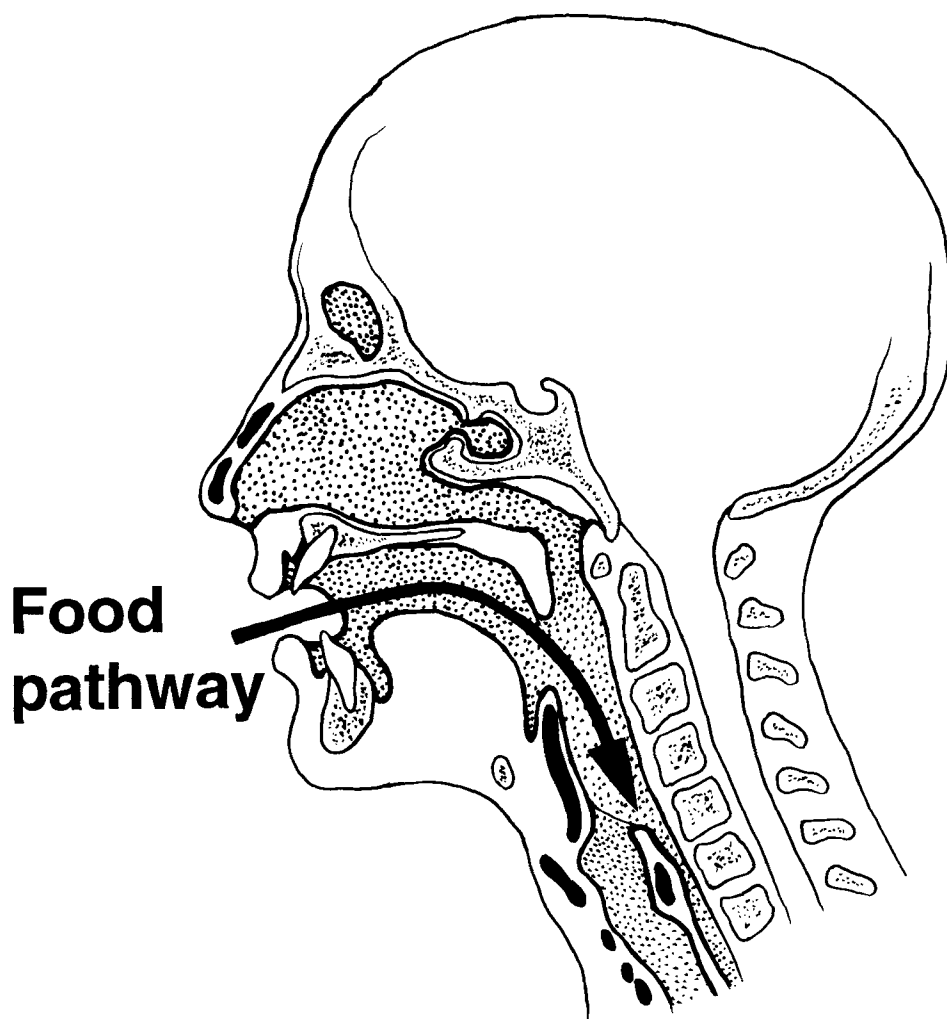


Fig. 2. Saggital view of the supralaryngeal vocal tract of modern adult *Homo sapiens* illustrating the "bent tube" system.

of the respiratory and digestive tubes in the supralaryngeal portion of the pharynx. The result is a single tube system with an enlarged supralaryngeal segment in adult humans (cf. Negus, 1949; Laitman et al., 1977, 1992; Lieberman, 1984; Lieberman and Crelin, 1971; Wind, 1970, 1990, 1992) (Fig. 2). As a consequence of these changes, ingested food and liquid are likely to be lodged in the pharynx, and the possibility of fatal choking presents a distinct selective disadvantage for humans. The evolution of this disadvantageous, costly system is explained as a result of selection for a speech apparatus capable of fine sound articulation and greater resonance (Lieberman, 1984). The elongation and bending of the human vocal tract is a developmental feature, for the human newborn's system is described as similar to the adult condition in other primates (Laitman et al., 1977, 1992). Ontological changes in the morphology of the vocal tract are linked with the appearance of articulate speech in human children (Lieberman, 1984).

In order to investigate when in the evolution of the hominid vocal tract and

speech capability these changes took place, Lieberman and Crelin reconstructed the supralaryngeal vocal tract of the Neandertal male from La Chapelle-aux-Saints. They began by comparing the fossil with crania of human newborns (representing the primitive, speechless condition) and modern human adults (representing the derived, articulate speech morphology). Their comparison is apparently modeled upon Boule's classic comparative analysis of a chimpanzee, La Chapelle, and a modern human, for they use the same orientation of La Chapelle (not on the Frankfurt horizontal [see discussion below of Houghton (1993)] and the modern human (on the Frankfurt horizontal).

Lieberman and Crelin (1971) describe La Chapelle as most similar to the newborn for the following characters when seen in lateral view: general cranial form, form of the temporal squamous portion, mandibular shape and relative proportion of the body and ramus, lack of a chin, angulation of the mandibular foramen, coronoid process breadth and mandibular notch depth, general basicranial morphology and orientation, relative size of the pterygoid process and orientation of the angle of its lateral lamina, angulation of the styloid process, and form of the cervical vertebral column. Lieberman and Crelin also compare the relative proportions of the palate and basicranium (from the posterior border of the palate to the anteriormost point on the foramen magnum). La Chapelle has equal-sized palate and basicranial portions, newborns have a relatively longer basicranium, and human adults generally have a longer palate than basicranium. Lieberman and Crelin emphasize that newborns and La Chapelle have a "relatively greater distance between the palate and the foramen magnum" than modern adults, and that this "is related to the similar relative size and shape of the roof of the nasopharynx in the Newborn and Neanderthal" (Lieberman and Crelin, 1971:208).

Based upon the overwhelming similarities they see between Neandertal and newborn morphology (in fact, they find almost no similarities between Neandertals and adults), Lieberman and Crelin modeled the La Chapelle supralaryngeal vocal tract after the newborn. They first determined the height of the hyoid bone and larynx by placing the hyoid at the estimated intersection of the geniohyoid muscle and the stylohyoid ligament (Lieberman and Crelin, 1971:208, Fig. 6). "Although the larynx was judged to be as high in position as that in Newborn and apes, it was purposely dropped to a slightly lower level to give Neanderthal every possible advantage in his ability to speak" (Lieberman and Crelin, 1971:209.) The tongue, pharyngeal musculature, and the laryngeal, pharyngeal, and oral cavities were then modeled, and a silicone cast was made of the nasal, oral, and pharyngeal air passages. When the articulatory capacities of the reconstruction were tested by computer simulation, La Chapelle was found to be limited in both vowel and consonant production, and probably had a somewhat "nasal" quality to his vocalizations. "Even if he (Neandertal) were able to make optimum use of his speech-producing apparatus, the constraints of his supralaryngeal vocal tract would make it impossible for him to produce "articulate" human speech, i.e. the full range of phonetic contrasts employed by modern man" (Lieberman and Crelin, 1971:217), although "his brain may have been sufficiently well developed for him to have established a language based on the speech signals at his command" (Lieberman and Crelin, 1971:221). In other words, Lieberman and Crelin suggest that Neandertals could speak, but that the range of possible sounds was smaller than that produced by modern adult human vocal tracts.

This view of limited Neandertal speech capabilities is maintained in subsequent publications by Lieberman, Crelin, and co-workers (Crelin, 1973, 1987; Lieberman, 1976a,b, 1984, 1988, 1989, 1991, 1992a,b, 1993; Lieberman and Crelin, 1974; Lieberman et al., 1972, 1990, 1992). Reconstructions of several other fossil hominids were made. Skhul V has a reconstructed vocal tract similar to modern adult humans. The Kabwe and Steinheim reconstructions are intermediate in morphology between Neandertals and modern adult humans, but found to be capable of producing human speech (Crelin, 1973, 1987; Lieberman, 1984; Lieberman et al., 1972). Both Lieberman (1984) and Crelin (1987) present hominid phylogenies

(quite different from each other) based upon their interpretations of the speech capabilities of the fossils they studied. What they hold in common is the view that while Neandertals were incapable of fully modern speech, *other archaic sapiens fossil specimens were capable of modern human speech*.

The Lieberman and Crelin reconstruction of the La Chapelle supralaryngeal vocal tract revitalized inquiry into the external evidence for the evolution of complex language. Their work is widely cited and for many anthropologists presents a convincing argument for limited hominid speech capabilities prior to the evolution of modern *Homo sapiens* (although, as mentioned above, this is not specifically what they concluded). However, their reconstruction is also heavily criticized by paleoanthropologists and anatomists. Lieberman and Crelin's basic assumption that the form of the modern human vocal tract with its low positioned larynx is due to selection for articulate speech is challenged by many researchers, who argue that other factors are important in larynx positioning. Changes in the position and orientation of the vocal tract have been related to the assumption of erect posture and subsequent flexion of the cranial base (cf. Negus, 1949; DuBrul, 1976). This is experimentally verified by the work of Riesenfeld, who produced cranial curvature and basicranial flexion in rats forced to adopt bipedalism. Attendent to those cranial changes is a "downward shift" of the larynx relative to the cranium, as the larynx and associated structures maintain their relations to the mandibular musculature and the circulatory and nervous systems (Riesenfeld, 1969). Ciani and Chiarelli (1992) propose that the increase in the size of the prefrontal cortex during hominization led to cranial reorganization and a compensatory downward shift of the larynx. While the downward shift in the larynx that occurs as a consequence of upright posture or changes in brain and cranial architecture might produce a better arrangement for speech production, the latter can be viewed as a by-product of ensuring that other critical functions such as swallowing and oral respiration, actions that occur with much greater frequency than speech, are possible (Bosma, 1975, cited in Sphuler, 1977).

In addition, research on speech production in non-human primates and in humans with loss of key speech elements [such as the tongue or larynx (cf. references in Sphuler, 1977)] suggests that the human larynx and supralaryngeal arrangement is only one of a number of configurations that are capable of producing speech with the full array of human characteristics. Use of different structures, like the syrinx of birds, or modifying head position and the shape of resonating structures such as sinuses or the oral cavity can also result in human-sounding speech in other species (T. W. Deacon, personal communication).

Many critics of Lieberman and Crelin (1971) argue that the basicranium on the La Chapelle cast used in their reconstruction is too damaged and distorted or that the original specimen is too pathological to justify their conclusions (Carlisle and Siegel, 1974; DuBrul, 1976; Frayer, 1992, n.d.; Heim, 1989), while others question the possibility of any accurate reconstruction of soft tissues like the supralaryngeal vocal tract. Several workers are particularly skeptical of the use of the styloid process for determining the position of the hyoid (Falk, 1975; Morris, 1974; Wind, 1976, 1978). The anatomical feasibility of a hyoid and larynx positioned above the mandibular border as it appears in the Lieberman and Crelin reconstruction is questioned. Falk (1975) determined that the position of the hyoid relative to the mandible is the same in human newborns, human adults, and chimpanzees. The hyoid lies at or below the mandibular border when heads are oriented in the vertical position, and not at the elevated level used in the Lieberman and Crelin reconstruction. A high positioned hyoid would prohibit swallowing, as the anterior digastric muscles would act as depressors rather than elevators of the hyoid (Arensburg et al., 1990; DuBrul, 1976; Falk, 1975). Comparative analyses of Neandertal and modern human mandibular morphology, particularly the form of the mylohyoid attachment and innervation, demonstrate the low positioning of the hyoid and larynx in both groups (Arensburg et al., 1990; Houghton, 1993). Other criticisms of the La Chapelle reconstruction include the lack of information about

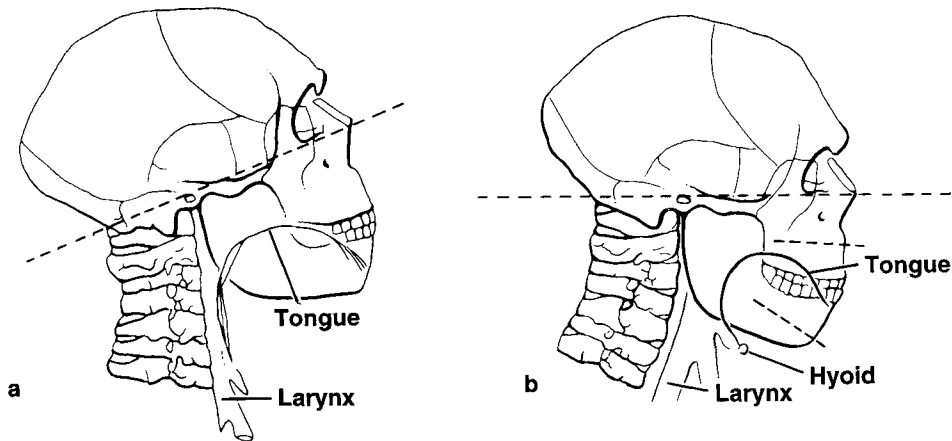


Fig. 3. a: Reconstruction of the La Chapelle-aux-Saints tongue and larynx position as depicted by Lieberman (1989). Redrawn from Lieberman (1989) in *The Human Revolution*, P. Mellars and C. Stringer (eds.), by permission of Edinburgh University Press. b: New reconstruction correcting anatomical errors, proposed by Houghton (1993). Redrawn from Houghton (1993), the *American Journal of Physical Anthropology* Vol. 90(2), by permission of Wiley-Liss, a division of John Wiley and Sons, Inc., ©1993.

how the skeletal morphology of La Chapelle was used to make the reconstruction (Carlisle and Siegel, 1978; Morris, 1974), questions about the anatomical validity of the newborn-Neandertal comparisons (Burr, 1976a; Carlisle and Siegel, 1974), the significance of basicranial dimensions and flattening (Arensburg et al., 1990; Frayer, 1992, n.d.; LeMay, 1975), and the lack of sufficient comparative modern human data (Carlisle and Siegel, 1974, 1978; LeMay, 1975, 1976). Gibbons' research (1974 [cited in Carlisle and Siegel, 1978], and 1977) suggests that La Chapelle's phonetic ability was within the range of variation for the same modern human sample used by Lieberman and Crelin.

Most recently, Houghton (1993) published a detailed critique of the La Chapelle supralaryngeal tract reconstruction. He points out several new problematic aspects of the reconstruction as it appears in the original publication (Lieberman and Crelin, 1971), and with the addition of a tongue in Lieberman (1984, 1989). Houghton argues that the figure of La Chapelle used in the reconstruction has to be oriented in the Frankfurt horizontal for a proper comparison with modern humans, and that doing so necessitates changes in the cervical vertebral orientation commensurate with bipedalism. The styloid and pterygoid processes that Lieberman and Crelin (1971) described as linking newborns with La Chapelle are then shifted into a modern adult human, rather than a newborn, orientation.

Houghton also questions Lieberman's (1984, 1989) assessment of the Neandertal oral cavity and tongue contour. Lieberman models the La Chapelle tongue on the modern human adult form, giving it a nearly circular posterior contour (after Ladefoged et al., 1972). It is unclear exactly how Lieberman determined the size of the tongue. He states that "the span of the tongue within the oral cavity is equal to the vertical distance between the hard palate and the epiglottis" and that "the modern tongue must span the long Neanderthal oral cavity. Since the distance from the prosthion of [to] the endobasion is long, the radius of the human tongue we have fitted to the Neanderthal skull must also be long" (Lieberman, 1989:403–404). Fitting this human-shaped tongue making the [I] vowel to La Chapelle, the larynx would have to be placed in the thorax! (Fig. 3). According to Lieberman (1984, 1989), the impossible fit of the modern human tongue to La Chapelle further supports the earlier conclusions that Neandertals could not have had a modern supralaryngeal vocal tract. Crelin (1987:224, Fig. 205) has also modeled a Nean-

dental tongue that appears equally problematic for producing modern human speech. In the Negus (1949) reconstruction of Gibraltar, the tongue is more pongid than human, but less pongid than Kabwe's (see Fig. 1).

Houghton suggests that a modern shaped human tongue can be fitted to La Chapelle if the following skeletal landmarks are used: "the superior genial tubercles, the mylohyoid line, the length of the palate, the anterior margin of the mandibular ramus, and the distance between the posterior aspect of the mandibular symphysis and the anterior aspect of the cervical vertebral column" (Houghton, 1993:141). Using these criteria, he argues that the tongue reconstructed by Lieberman rests too low relative to the incisors. When this is corrected, the overall contour of the tongue is raised. The posterior limit of the tongue can then be determined by the posterior extent of the mylohyoid line and the anatomical relations between the hyoid bone and the mylohyoid, geniohyoid, and genioglossus muscles which attach to the body of the bone. The resulting tongue profile fills the oral cavity as in modern humans and does not impinge upon the oropharynx and the vertebral column (Houghton, 1993). Houghton concludes that the ways in which Neandertal mandibles and maxillae differ from modern humans should not affect the positioning of the tongue and the vocal tract, but rather more anterior areas such as midfacial prognathism. This is supported by the detailed analysis of the Kebara 2 mandible (Tillier et al., 1989).

*Vocal tract reconstructions using the basicranium.* As an outgrowth of the work on the La Chapelle supralaryngeal vocal tract, Laitman and co-workers (1978) developed a simpler technique for assessing speech capabilities based on measurements of the cranial base. They were thus able to extend the inquiry into the evolution of speech to include many more fossil specimens. The use of the basicranium as the "roof" of the supralaryngeal tract is the keystone of Laitman and his co-worker's research on the speech capabilities of fossil hominids (Laitman, 1985; Laitman et al., 1978, 1979, 1992, 1993; Laitman and Reidenberg, 1988). They contend that the cranial base is a conservative, relatively less variable part of the anatomy because so many important anatomical systems interface there. Changes in basicranial form might therefore indicate more substantial evolutionary developments (Laitman, 1985; Laitman et al., 1992).

Based upon their research on the comparative anatomy of the supralaryngeal vocal tract, Laitman and his co-workers propose that there is an overall relationship between the form of the basicranium and the positioning of soft tissues such as the larynx and pharynx. A low positioning of the larynx is associated with basicranial flexion (as seen in modern adult humans), while a high position of the larynx is characteristic of crania which have flattened, elongated bases (such as non-human primates and human newborns). A high position of the larynx limits speech as tongue mobility and the resonating quality of the supralaryngeal tract are affected. The form of the basicranium in fossils is determined by taking a series of measurements along the midline of the basicranium, standardizing them for size, and constructing a "basicranial line" that profiles the flexion of the cranial base (Fig. 4). The craniometric points employed are prosthion, staphylion, hornion, sphenobasion, and endobasion (Laitman et al., 1979). Neandertals measured in this way (such as La Chapelle, La Ferrassie 1, Circeo 1, Saccopastore 2, Gibraltar 1 and Teshik-Tash) are quite variable in their cranial base form but generally show greater platybasia than modern adult humans, and are described as having "a different, narrower range of vocalization available to them than do modern humans" (Laitman et al., 1979:31). Steinheim, Kabwe, and several Upper Paleolithic crania are more similar to modern adult humans in their degree of basicranial flexion, implying greater speech capabilities than Neandertals. Subsequent research on a broader array of fossils suggests that "while . . . basicranial and upper respiratory changes were beginning with early members of the genus *Homo*, such as *H. erectus*, full basicranial flexion, similar to that of modern humans, does

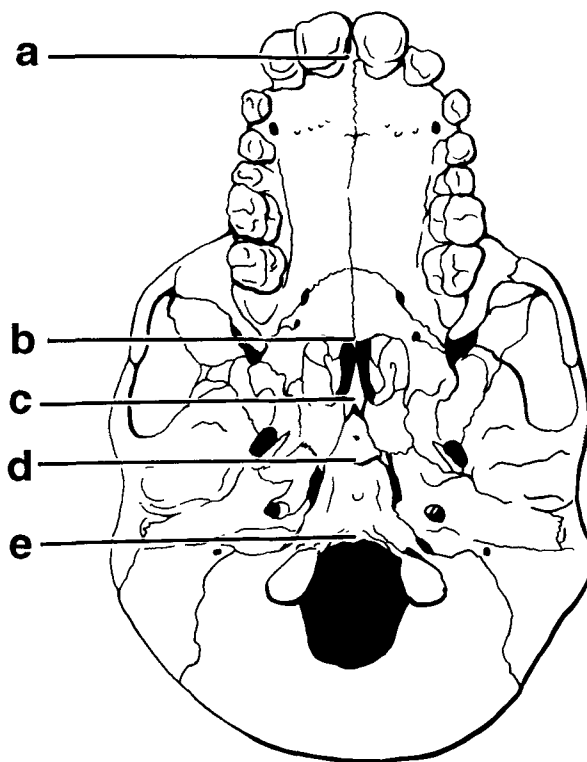


Fig. 4. Basicranial view of an adult female chimpanzee (*Pan troglodytes*) showing the craniometric points employed in the analyses of Laitman and co-workers to construct midline profiles of the cranial base. a, Prosthion; b, staphylion; c, sphenion; d, sphenobasion; e, endobasion. Redrawn from Laitman et al. (1979), the American Journal of Physical Anthropology Vol. 51(1), by permission of Wiley-Liss, a division of John Wiley and Sons, Inc., ©1979.

not appear until the arrival of our own species, *H. sapiens*, some 300,000 to 400,000 BP, as evidenced by hominids such as Petralona from Greece or Broken Hill (Kabwe) from Zambia. It was thus *with our own group* that fully modern upper respiratory tracts first appeared" (Laitman et al., 1992:393, emphasis added).<sup>3</sup>

The basicranial line studies of Laitman et al. therefore reach the same conclusion as the supralaryngeal vocal tract reconstruction studies: Neandertals were different from modern humans in their speech capabilities. These basicranial line studies also conclude that *other archaic sapiens (or erectus?) fossil specimens were capable of modern human speech*.

The basicranial line studies, like the supralaryngeal vocal tract reconstructions, have been criticized on a number of grounds (cf. Arensburg et al., 1990; Burr, 1976a,b; Frayer, 1992, n.d.; Heim, 1989). The major assumption of these studies that there is an association between vocal tract form and position, variation in cranial base morphology, and speech capabilities is yet to be demonstrated. As a test of this proposed association, Laitman and Reidenberg (1988) experimentally altered the cranial base of rats by removing the sphenoccipital synchondrosis.

<sup>3</sup>As this statement illustrates, Laitman et al. (1992) use basicranial flexion as a taxonomic indicator [see especially Laitman (1980), a comment on Krantz's (1980) "Sapientization and speech"]. Membership in "our own group," presumably referring to modern *Homo sapiens*, is extended by Laitman to any cranium having a highly flexed cranial base and, inferably, fully modern speech. Other paleoanthropologists would most likely view this as an argument for the development of modern speech potential in late *Homo erectus*.



They describe the change in the rat cranial base as "a kyphosis (flexion)," yet their illustration (Laitman and Reidenberg, 1988:106, Fig. 3) suggests the rat cranial base actually flattens as the basioccipital bone is inferiorly displaced. Also, the inferior and anterior movement of the hyoid and larynx that they depict seems to reflect merely a compensatory shift to retain functional anatomical relations. While their work appears to provide support for their idea that changes in the form of the cranial base affect the position of the vocal tract, it cannot be used to argue that basicranial flexion is related to low positioning of the hyoid and larynx.

Another criticism of the basicranial line studies involves the implied significance of different degrees of flexion. As discussed in Arensburg et al. (1990), the considerable variation observed in cranial base flexion in living and prehistoric modern humans, Neandertals, and other archaic *sapiens* (as documented by Burr, 1976b; Frayer, 1992, n.d.; Laitman et al., 1979; LeMay, 1975; Grosman, 1979) may have little effect on supralaryngeal space and speech capabilities. The studies of Solow (1966) suggest nasopharyngeal volume is maintained by changes in maxillary form independent of cranial base flexion. Arensburg et al. (1990) argue that the flexion of the basicranium is irrelevant for determining the position of the hyoid and larynx, and that it is the dimensions and morphology of the mandible that are critical for evaluating the relative level and position of these elements (see also Houghton, 1993).

The accuracy of cranial base measurements made on fragmentary, reconstructed, and distorted fossil remains is also problematic. In particular, the use of La Chapelle-aux-Saints is questioned because much of the cranial base is reconstructed. A new restoration of the fossil by Heim (1989) verifies that the cranial base is not as flat as it appears in the earliest reconstruction. Heim therefore rejects the arguments that La Chapelle and Neandertals were not anatomically capable of producing the same range of vowels and consonants as modern humans. Frayer (1992, n.d.) evaluates the degree of basicranial flexion in Neandertals (including the newly reconstructed La Chapelle) using the angle between the basion-sphenobasion and basion-prosthion chords. He demonstrates that Neandertal basicranial flexion is within the range of variation for European Late Upper Paleolithic and Mesolithic samples and that cranial base flattening cannot be used to distinguish Neandertals nor does it provide evidence for a reduced linguistic capability.

*The hyoid.* Researchers working on the external evidence for complex language evolution have long lamented that "bony landmarks such as the hyoid bone or styloid process which give clues to the position and shape of upper respiratory structures, are . . . often missing. Thus, the configuration of the upper respiratory system of fossil hominids has remained a mystery" (Laitman et al., 1979:15). In 1983 the first of the missing pieces of this mystery was discovered: a complete hyoid bone from a well-preserved adult male skeleton, Kebara 2, situated in Mousterian layers (dated to ca. 60,000 BP; Valladas et al., 1987) of Kebara Cave, Israel (Arensburg, 1989, 1991a; Arensburg et al., 1985). For the purposes of this discussion, I will consider Kebara 2 to be a Neandertal, although given recent debates about Neandertal variability in Europe and the Middle East, it might be more prudent to refer to it only as a Middle Palaeolithic hominid (Arensburg, 1991b; Schepartz, 1992).

The hyoid was found undisturbed, anatomically *in situ* within the mandibular region of Kebara 2, as the fossil was being prepared in the laboratory. It consists of the body (corpus) and the two unfused greater horns (cornua). The lesser horns are missing and were probably cartilaginous, as is often the case in living humans (Arensburg et al., 1989).

The Kebara 2 hyoid (Fig. 5) is not morphologically or metrically distinctive when compared to various samples of modern human hyoids for a series of individual measures (Arensburg et al., 1989, 1990). A good overall measure of hyoid shape

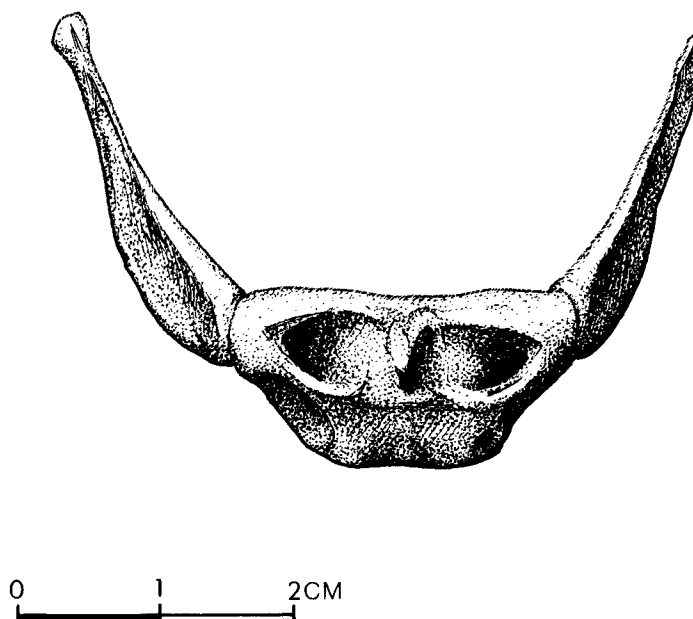


Fig. 5. Anterior view of the hyoid bone from Kebara Mousterian Hominid 2 showing the body and greater horns. Reprinted from Arensburg et al. (1990), the *American Journal of Physical Anthropology* Vol. 83(2), by permission of Wiley-Liss, a division of John Wiley and Sons, Inc., ©1990.

and size is the transverse/sagittal ratio, recently defined by Papadopoulos et al. (1989). The Kebara 2 hyoid, characterized by its very divergent greater horns, has a calculated ratio of 1.96, well within the modern human range of variation (0.97 to 2.33) reported by Papadopoulos et al. (1989). Morphologically, the Kebara 2 hyoid is virtually identical to the hyoids of modern humans, both in terms of its muscular attachment areas and in terms of corpus form, cornua size and shape, and the angulation between these elements. It is markedly different from the hyoids of gorillas, chimpanzees, and orangutans. This suggests a basically modern human hyolaryngeal apparatus for Middle Palaeolithic hominids (Arensburg et al., 1990; Arensburg and Tillier, 1991).

Further information about the speech capabilities of Neandertals and Middle Palaeolithic hominids can be ascertained from the analysis of the Kebara hyoid relative to other anatomical structures. While the hyoid is often described as a "free-floating" bone due to its lack of direct attachments to other skeletal elements, this description is misleading because the hyoid is connected through a set of muscular and ligamentous relations to the larynx, pharynx, mandible, cranial base, and scapula. The Kebara 2 cranium is missing, but the excellent preservation of the hyoid, mandible, and cervical vertebrae (the only complete vertebral column known for a Neandertal) enabled Arensburg et al. (1990) to assess the position of the hyoid relative to those elements. Based on the following observations, they argue that Middle Palaeolithic peoples had a low positioned hyoid and larynx, as found in modern human adults: 1) while the Kebara (and other Neandertal) mandibles are remarkably robust in some respects, muscular markings on the mandible and hyoid follow the pattern seen in modern humans, suggesting a similar suite of muscular relations; 2) the position of the hyoid relative to the cranial base is contingent on head and neck posture. With a modern lordosis of the cervical vertebrae as seen in Kebara 2 and other Neandertals and a cervical vertebral column length within the modern human range of variation (Arensburg, 1991a), the hyoid must be positioned low relative to the cranial base; 3) the hyoid has a



Fig. 6. Superior view of the Kebara Mousterian Hominid 2 hyoid and mandible. Reprinted from Arensburg et al. (1990), the American Journal of Physical Anthropology Vol. 83(2), by permission of Wiley-Liss, a division of John Wiley and Sons, Inc., ©1990.

relatively fixed position with regard to the mandible, lying roughly at or below the inferior border, as demonstrated by Falk (1975). This hyoid-mandibular relationship is independent of head positioning or cervical lordosis; 4) the Kebara 2 hyoid is of modern human proportions and morphology, and would not have occupied a large proportion of the supralaryngeal space, as might a pongiform hyoid (Arensburg et al., 1990) (Fig. 6). A reconstruction of the Kebara supralaryngeal region using these observations does not display any reduction of the supralaryngeal space, in contrast to prior assessments of Neandertal individuals (Tillier et al., 1992). These observations and conclusions have subsequently been supported by the independent research of Houghton (1993) on La Chapelle-aux-Saints, and Duchin (1990) on oral anatomy, tongue positioning, and articulation.

From the evidence of Kebara 2, Arensburg et al. (1990) argue that modern adult humans, rather than human newborns or pongids, are the most appropriate model for reconstructing the supralaryngeal vocal tract of Neandertals and other Middle Palaeolithic hominids. This direct challenge to the work of Lieberman, Laitman, and co-workers has not gone unanswered.

Aside from questioning the low positioning of the hyoid and larynx in Middle Palaeolithic and Neandertal peoples proposed by Arensburg et al., Laitman et al. (1990) and Lieberman et al. (1990) suggest that the Kebara hyoid, as a "singular" discovery, is not useful for evaluating the evolution of the hominid supralaryngeal vocal tract. If this stricture were actually applied in paleoanthropology, we might yet be awaiting reassessment of the robust australopithecines pending further discoveries of complete *A. aethiopicus* crania. All fossil finds are unique discoveries. And as illustrated by the discovery of the Taung child more than 60 years ago, singular discoveries are often critical in challenging existing paradigms and theoretical perspectives.<sup>4</sup>

<sup>4</sup>Interesting parallels exist between the reactions to the Kebara 2 hyoid and the responses to other hominid

The metrical analysis of the Kebara hyoid is also questioned (Laitman et al., 1990; Lieberman, 1991, 1992, 1993; Lieberman et al., 1992). It has been proposed that the metrics of Kebara might just as easily be used to align it with pigs as with modern humans. It is not clear whether Laitman et al. (1990) seriously consider the Kebara hyoid to be that of a pig. A sample of local pig hyoids collected in Israel (understandably limited) does not support their argument on metric or morphological grounds (perhaps they are referring to a special species of laboratory pig?), especially as it is the total metrical *and* morphological pattern of the hyoid that is important (cf. Frayer, 1993, n.d.).

The view that Neandertals are linguistically limited by the form of their vocal tract is still a predominating theoretical perspective in paleoanthropology *because it concurs with the view that complex language and speech are unique to modern humans*. Therefore it is important to emphasize that, no matter which interpretation of Neandertal supralaryngeal structure is ultimately upheld, there is still evidence suggesting that hominids other than modern *Homo sapiens* were *anatomically capable* of producing the full range of sounds characterizing modern speech. This external evidence for complex language, which includes both neurological and vocal tract data indicating speech capabilities preceding the origin of modern *Homo sapiens*, is often disregarded or dismissed in light of evidence for the internal aspects of complex language evolution.

#### *Internal aspects*

The internal aspects of complex language, which are here divided into cognition (consciousness, sequential thinking and planning, mapping and simulation of the natural world) and symbolism, are thought to be represented in numerous types of paleoanthropological data, primarily archaeological in nature.

#### *Cognition.*

Interest in the evolution of aspects of cognition such as sequential thinking and planning has been revived primarily due to the assertions of Binford (1981, 1982, 1985, 1987, 1989, and as quoted by Fischman, 1992) that hominid behavior in the past was not necessarily cognitively structured as it is in the present. In particular, Binford challenges the view that Middle Paleolithic as well as earlier hominids were effective and strategic hunters, capable of various sorts of "curation" and planning. In the following sections some of the evidence for the cognitive basis of these behaviors in Neandertals and other archaic *sapiens* will be examined.

*Brain volume and asymmetries.* As discussed in the previous section on the brain, paleoneurologists seem to be in total agreement not only about the modern size of Neandertal brains, but also about their morphological similarity to modern human brains. Some reorganization of the cerebral cortex, apparent in the asymmetrical development of the hemispheres and specific regions where complex language processing takes place, is evident as early as *Homo habilis*. This may reflect the evolution of a capacity for the symbolic and spatiovisual integration necessary for complex language and tool use (Deacon, 1992; Falk, 1983; Holloway, 1974; Tobias, 1987, 1992). Consciousness also appears to be strongly linked to the dominant hemisphere (Aiello and Dean, 1990), as is analytical, time-sequence processing (Falk, 1987).

*Faunal assemblage composition.* As subsistence activities involve decisions and planning of individual and/or group behaviors, then differences in cognitive

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fossil discoveries that have challenged then dominant theoretical perspectives such as the Neandertals, the Trinil *Homo erectus*, and the Taung child. The first reactions are typically dismissive and denegrating, acting to question either the authenticity and provenience of the find or its interpretation. Later reactions reflect more serious attempts to incorporate the new data into the existing framework, rather than accepting that the framework itself needs revision.

abilities should be represented by the faunal assemblages of prehistoric sites. With this rationale in mind, several archaeologists have compared the fauna from Middle Paleolithic and Upper Paleolithic sites in order to evaluate possible cognitive differences between Neandertals, other archaic *Homo sapiens*, and early modern *Homo sapiens*. The underlying assumption is that "better-adapted" populations exhibit subsistence behaviors that reflect greater control over the environment and animal resources. Unfortunately, there is little agreement over what kind of behavioral adaptation is better, more successful, or "modern." S. R. Binford (1968) initially proposed that the shift to hunting of large migratory herds was the key factor in the evolution of modern *Homo sapiens*, but this hypothesis has been refuted by analyses of Middle Paleolithic faunas in Europe and the Levant that show exploitation of herds precedes modern *sapiens* origins (cf. Chase, 1989, Clark and Lindly, 1989a,b). Predominance of one mammalian species in a faunal assemblage has often been regarded as "specialization" and therefore a more sophisticated use of resources, yet both specialized and generalized faunas have been found in Middle Paleolithic and Upper Paleolithic contexts (Chase, 1989; Stiner, 1992).

While many archaeologists disagree with his conclusions, L. Binford has been influential in the development of more critical fauna studies. Based on analyses of a wide range of sites from different times and environments, Binford proposes that hunting as a major subsistence strategy developed late, as part of the transition to modern behavior. The general Neandertal/Middle Paleolithic/Middle Stone Age pattern was predominantly one of scavenging with limited opportunistic hunting of smaller and medium-sized mammals. Males foraged wider for fauna and lithic sources, made more elaborate tools, and did not share food with females and children. Binford argues that Neandertals showed little evidence of in-depth planning, curation, or storage, although they did transport some faunal elements for preparation and processing (Binford, 1985, 1987, and as quoted in Fischman, 1992). Few archaeologists agree entirely with Binford's conception of little or no evidence for planning in archaic lifeways (cf. arguments in Hayden, 1993; Mellars, 1989a), but due to his influence a greater role for scavenging and carnivore activity is now acknowledged for most faunal assemblages.

Recent regional faunal assemblage comparisons illustrate the diversity and complexity of both Middle Paleolithic and Upper Paleolithic procurement strategies. For example, Straus (1977, 1990) describes the Middle Paleolithic adaptation in the Iberian peninsula as a low-level, opportunistic foraging/scavenging lifestyle. This is succeeded by an Early Upper Paleolithic adaptation with some development of technology (but no extensive evidence of herd-hunting) that "sets the stage" for Late Upper Paleolithic subsistence intensification where there is the development of specialized techniques and weaponry for hunting a few key herd species (Straus, 1977). Straus's interpretation has been questioned by Clark (1987), who suggests that the Later Upper Paleolithic "specialization" may simply reflect the sampling of alpine level sites where herds of ibex clustered. Chase (1989) found little difference between Middle Paleolithic and Upper Paleolithic mammalian faunas in Europe, and suggests that both time periods provide evidence of game drives and jump kills that indicate extensive cognitive capacities. Stiner (1990, 1991, 1992) found that Mousterian and Upper Paleolithic peoples and hyaenas all exploited the same species of ungulates in coastal Italy. There was, however, more variation in the procurement of ungulates from site to site by the Mousterians, and overall the Mousterian diet was more diverse as it included shellfish, tortoise, and scavenged elephants. Stiner suggests that mere comparison of prey species is not informative and that it is necessary to determine how the same species and classes of food might be differently exploited. Furthermore, Stiner and Kuhn (1992) document trends *within* the Mousterian toward the modern human pattern for selective ambush hunting of prime adult prey, which may reflect a local response to changing ecological conditions or an evolutionary shift in behavioral capabilities. Soffer (1989, 1992) describes a transition from more

regionally circumscribed opportunistic Middle Paleolithic subsistence to the mapping of resources over wider areas and seasonal group mobility in the Upper Paleolithic of the Russian Plain. She emphasizes that this change in procurement reflects "differences in performance rather than innate abilities" and that the different patterns are not associated with different types of hominid. In the Levant, the mammalian species hunted in the Mousterian were exploited in the same way during the Middle Paleolithic, regardless of whether Neandertals or early modern *Homo sapiens* are thought to have formed the assemblage. There is evidence for both scavenging and hunting. Differences between assemblages appear to be related to site location or environmental fluctuations rather than differences in subsistence strategies (Bar-Yosef, 1989; Clark and Lindly, 1989a,b). Preliminary analysis of the Middle Paleolithic and Upper Paleolithic fauna from Kebara Cave suggests changes over time in the composition of fallow deer and gazelle samples that might reflect seasonality of site use or more fundamental changes in technology and the organization of procurement (Bar-Yosef et al., 1992).

Studies suggesting no difference in Mousterian and Upper Paleolithic faunal subsistence are now probably as numerous as those suggesting major differences. Except in a few cases, however, the fauna analysis for particular sites or regions is not sufficiently detailed or complete enough to address the issue of cognitive differences between archaic *sapiens* and Upper Paleolithic peoples. Even where the fauna has been extensively studied, the interpretation and analysis of different researchers has led to vastly disparate conclusions about hominid activities. At Klasies River Mouth Cave, for example, Klein (1976, 1989b) has argued that the Middle Stone Age "modern" occupants hunted mammalian fauna but did not exhibit fully "modern" subsistence behavior; Binford (1984) argued that they were scavenging large bovids, and Deacon (1989; Deacon and Shuurman, 1992) contends that they were as behaviorally modern as Later Stone Age peoples.

The important conclusion to be drawn from these faunal analyses is that archaic *sapiens* populations, including Neandertals, were capable of a wide array of procurement strategies that ranged from reliance on a select number of hunted mammalian species to combined hunting and scavenging, and even what appear to be planned drives of horses, bison, and cervids into deep ravines (Chase, 1989; Mellars, 1989a,b; Schild et al., 1988, cited by Bar-Yosef, 1990-91). Their cognitive prowess in food procurement appears equal to that evident in faunal assemblages accumulated by early modern *Homo sapiens*.

*Intrasite diversification.* Evidence of intrasite diversification has been interpreted as reflecting a level of complex cognition in the Upper Paleolithic that is generally lacking in the Middle Paleolithic (Binford, 1989). Mellars (1989a) cites the scarcity of well-defined structures, obvious arrangements of hearths, pits, and other features indicative of a social construction of space in Neandertal habitations, and questions the evidence for specialized activity areas at sites associated with even earlier hominids. Hayden (1993) contests this and describes the remains of huts, stone pavements, and walls and physical barriers from pre-Neandertal as well as Middle Paleolithic contexts. Recent descriptions of the Middle Paleolithic deposits in Kebara Cave suggest differentiated uses of the living area by Neandertals that include the dense accumulation of hearths in the central area of the cave, an extremely thick bone accumulation (over 1 m in depth) in the central area of the cave characterized by cut marks and relatively little carnivore gnawing, and the removal of bone and larger lithic refuse from the central area to the north wall of the cave (indicating "cleanliness" according to Bar-Yosef and Vandermeersch, 1993) (Bar-Yosef, n.d., Bar-Yosef et al., 1992).

Based on the evidence from faunal assemblages and intrasite diversification, it can be argued that Neandertals were not particularly different in their planning, cognition, or social configuration of space from early modern *Homo sapiens*. It may be that in certain regions, such as Western Europe, a contrast in relative abun-

dance of intrasite diversification distinguishes the Middle and Upper Paleolithic, but in the Levant this distinction is not apparent.

### Symbolism

*Burial.* The act of deliberately disposing of human dead by any means distinguished from the disposal of other refuse can be considered as burial treatment. This act, whether it involves placing the deceased in trees or elaborate sepulchres, represents a consciousness and awareness of self or one's species as distinct from the natural world. With the practice of burial, the body has become a symbol of identity with the species. Treating the body upon death is not synonymous with religion, as is often claimed, although "ritual" in the form of typical behaviors (such as placing the dead at the back of the cave) may in fact be involved. Humans today are the only species that buries its dead,<sup>5</sup> and much significance is accorded to the evolution of this "uniquely human" behavior.

The earliest evidence of burial treatment in the paleoanthropological record comes from the archaic *sapiens* populations of the Middle Paleolithic (Belfer-Cohen and Hovers, 1992; Binford, 1968; Chase and Dibble, 1987; Harrold, 1980; Klein, 1989a; Smirnov, 1989; Solecki, 1971; Tillier, 1990; Tillier et al., 1988). Russell (1987) proposes that the hominid bones from Krapina rockshelter in Croatia display cutmarks produced by the defleshing of decomposing bodies. If this is accepted as evidence of burial treatment [as opposed to cannibalism (Malez, 1970)], then Krapina is the earliest evidence of burial treatment, as the site may date to the Last Interglacial, preceding other European or Middle Eastern burial sites (Klein, 1989a). A current tally of Middle Paleolithic burials compiled by Belfer-Cohen and Hovers (1992) lists 59 individuals from a total of 17 sites in Western Europe, Southwest Asia, and South Africa.

Yet burial as evidence of symbolic behavior preceding the origin of modern *Homo sapiens* has not gone unchallenged. Chase and Dibble (1987) argue that the only Middle Paleolithic burials with symbolism contain early anatomically modern humans accompanied by clear evidence of grave goods. Clark and Lindly (1990) suggest that *none* of the Middle Paleolithic burials, regardless of their hominid "association," provide good evidence for symbolic behavior. Both of these studies propose that burials are not "symbolic" if they do not contain grave goods or elements distinctive from the rest of the site materials. What these and other researchers overlook is that *all Middle Paleolithic burials contain symbolic evidence—that of a hominid body intentionally positioned by other hominids.*

The question of what actually constitutes evidence for Neandertal burial was raised by Gargett (1989), who proposes that many of the early reported Neandertal discoveries described as burials might be natural deposits. This assertion has been strongly contested on several grounds [see comments following Gargett's (1989) article]. Carefully documented excavations of Neandertal burials like Kebara 2 (Fig. 7) provide evidence for many "definitive" burial criteria such as skeletal articulation, flexed body position, use of a pit (Bar-Yosef et al., 1992), and selective use of areas for burial within a site (Bar-Yosef, 1988).

More recently Belfer-Cohen and Hovers (1992) compared "contested" Middle Paleolithic "burials" from the Levant with later "uncontested" Natufian "burials" dating from 12,000–10,000 BP. Their work elucidates the fundamental difficulty of evaluating the premodern *Homo sapiens* evidence for symbolic burial. Citing examples where the evidence for burial is equivalent for both samples but where "burial" is questioned for the Middle Paleolithic, they argue that Middle Paleolithic burials are subjected to much more rigorous scrutiny because of an attitude reflecting "a refusal to accept the possibility that hominids other than *H. sapiens*

<sup>5</sup>The classic tales of elephant graveyards are unfortunately just rumors. However, like many other mammalian species, elephants have been observed trying to revive dead conspecifics (Moss, 1982), and therefore display aspects of consciousness and self-awareness.

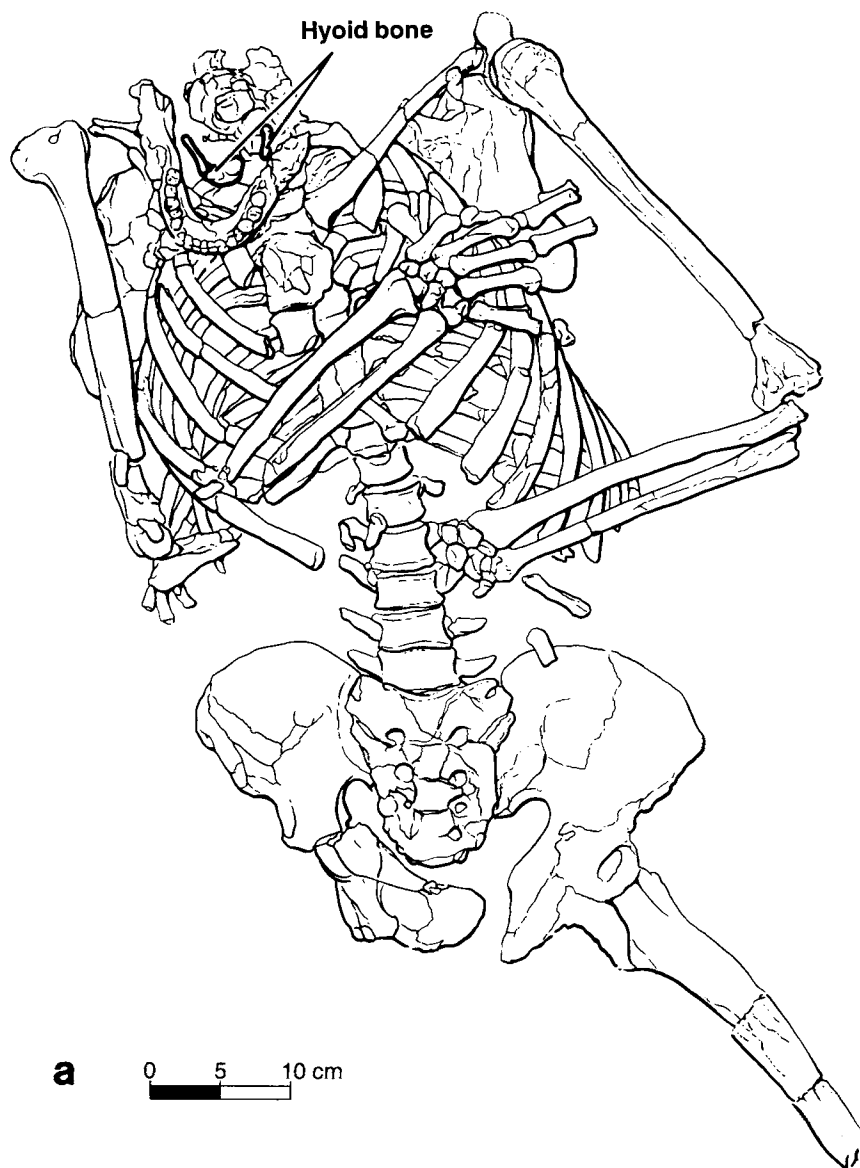


Fig. 7. a: Diagram of the Kebara 2 skeleton in situ with the hyoid bone between the mandible and the cervical vertebrae. b: Section from the deep sounding of Kebara Cave, showing the stratigraphic position of the Kebara 2 burial in a pit. Both figures redrawn from Bar-Yosef and Vandermeersch (1991): *Le Squelette Moustérien de Kébara 2*, with the permission of CNRS editions.

*sapiens* reached the level of symbolic sophistication expressed, among other things, in intentional burials. . . . it [recognition of burial] appears to rely on the physical-anthropological and cultural context. . . . intentional burials are recognized only when Middle Paleolithic human remains are of anatomically modern individuals, since on the basis of their biological resemblance to modern humans they are



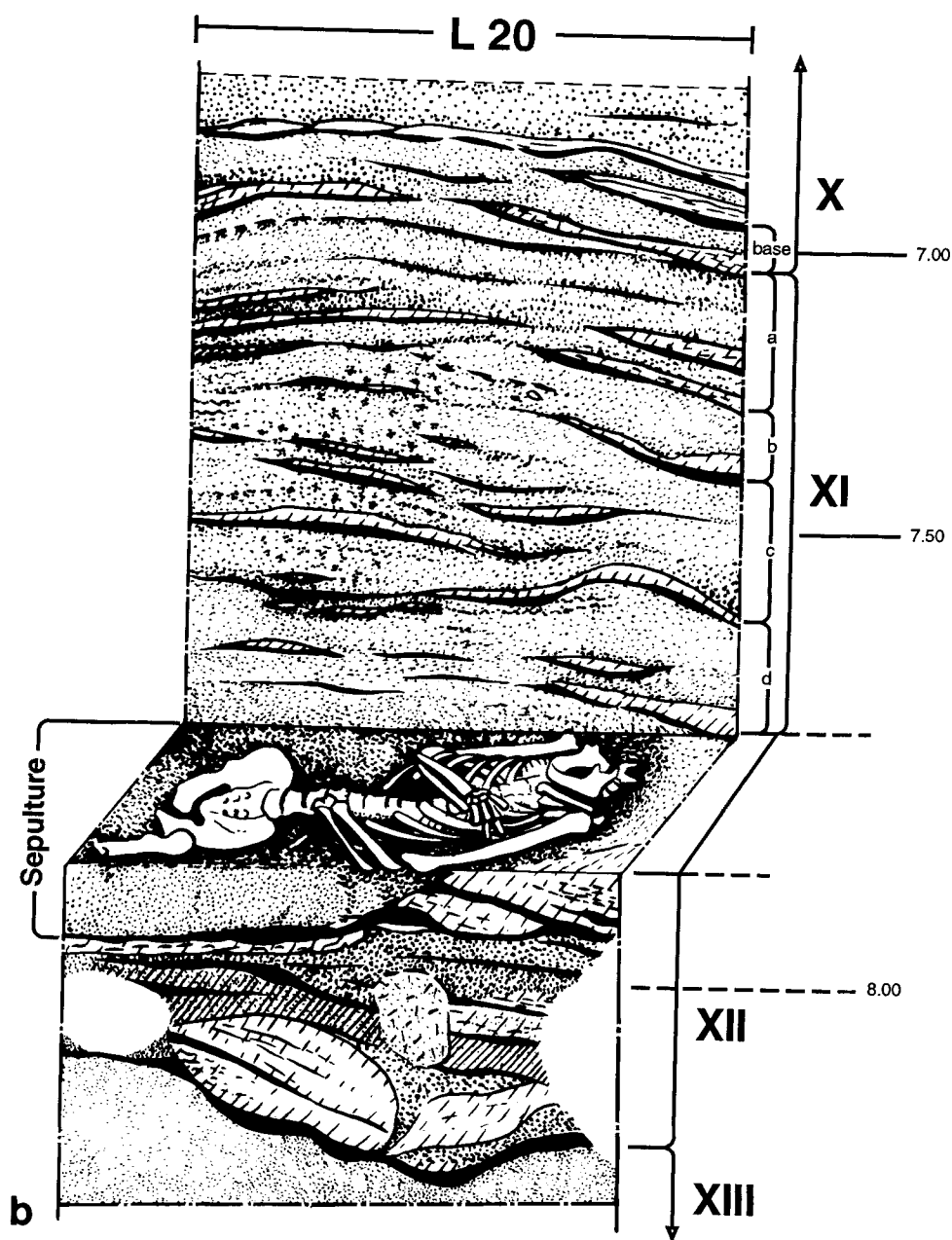


Fig. 7b.

granted the capacity for complex behaviors such as mortuary practices” (Belfer-Cohen and Hovers, 1992:468–469).

*Ornaments.* Turner (1980:112, cited by White, 1989b) describes the surface of the body as the boundary between the individual and the world, the “frontier of the

social self" and the "symbolic stage upon which the drama of socialisation is enacted." As expressions of a complex language system, ornaments can present a means for communication or information exchange (Wobst, 1977). Ornaments can function as symbols of their owner or fabricator, acting to "name" individuals, or can "represent" them independently in a manner that can only be termed displacement. Use of shared ornamentation can also signal group membership, displaying "emblemic" style as defined by Wiessner (1983, 1989, 1990).

The question of ornamentation use and its functional role before the origin of anatomically modern *Homo sapiens* centers on the authenticity of materials pre-dating the Upper Paleolithic. Marshack (1989) describes an array of evidence for body ornamentation in the Lower, Middle, and Upper Paleolithic. The record is slight for the earlier periods, but there is some evidence for the piercing of animal teeth and bone for use as beads and pendants at sites that may date as early as 110,000 BP [for example from Bocksteinschmiede in Germany (Wetzel and Bosinski, 1969)]. The production of holes was imprecise and usually involved the creation of connected funnel-shaped concavities on opposing sides of the elements. The beads and pendants Marshack (1989) depicts are natural skeletal or dental elements modified for suspension only.

Pigments such as ochre and black manganese dioxide can also be used to decorate the body, and many pieces (including those in the form of crayons) have been found in Lower and Middle Paleolithic sites (Marshack, 1981; Singer and Wymer, 1982; Wreschner, 1980). The most impressive example, as described in Marshack (1981, 1989), is from the site of Becov in the Czech Republic. There the production of red ochre powder is suggested by the presence of a striated ochre lump and abraded quartzite stone together in association with a large quantity of ochre powder. Although ochre usage is generally accepted as evidence for symboling (Mellars, 1989a), Lower and Middle Paleolithic ochre is not found in a context that clearly indicates use in a symbolic context, according to Chase and Dibble (1987). In particular, they contrast the early evidence for ochre scattered randomly in sites with its later, clearly symbolic presence in Upper Paleolithic burials.

Because the evidence for body ornamentation from the Lower and Middle Paleolithic is so different from the record for the Upper Paleolithic, it is usually viewed with a great deal of skepticism (cf. White, 1989a,b). Many of the pieces are dismissed as bearing only natural alterations or their provenience is questioned (Chase and Dibble, 1987; White, 1992). Conversely, Davidson and Noble (1989: 127) provide a table of "documented early objects with deliberate marks" which includes a few pieces that may have been used as ornaments, but they do not attribute any symbolism or representation of shared meaning to these objects.

White (1989a,b, 1992, 1993) sees no precedent for the florescence of the Chatelperronian and the Aurignacian in the Mousterian or Lower Paleolithic. He argues that the few oft cited examples of Mousterian ornamentation "stand out amidst thousands of years of symbolic silence" and further states that "without conclusive evidence for patterning and repetition, it is fruitless to maintain that these objects were operative in a symbolic context, let alone one of body ornamentation" (White, 1989a:225, emphasis added). Emphasizing what he calls the sudden, "explosive" appearance of carefully crafted body ornamentation made from exotic raw materials in the archaeological record of Western Europe beginning with the Aurignacian (approximately 40,000 BP), White correlates this change with the appearance of anatomically modern *Homo sapiens*. He links the artifactual change with a fundamental change in social complexity (but not necessarily a change in mental capacity) and the expression of complex ideas and social metaphors (White, 1992, 1993).<sup>6</sup>

<sup>6</sup>However, the idea of an Aurignacian "explosion" of body ornamentation may be overstated. The evidence should not be viewed in terms of individual item counts, for the distribution of beads is actually limited to a few sites (as acknowledged by White), and may represent a much smaller number of articulated ornaments (Simek, 1992).

In his analysis of Upper Paleolithic ornaments, White (1989b) includes the Chatelperronian with the Aurignacian and views them both as the product of modern *Homo sapiens*. However, as the only hominid securely associated with the Chatelperronian is the Neandertal from St. Césaire (Leveque and Vandermeersch, 1980), it may well be that late Neandertals sported the Chatelperronian ornaments (Simek, 1992). Harrold (1989) also suggests that Neandertals made the Chatelperronian objects, based upon his lithic analysis documenting the indigenous development of the Chatelperronian from the Mousterian. Conversely, Chase and Dibble (1987) and Mellars (1989b) deal with this Chatelperronian/Neandertal dilemma by suggesting that Chatelperronian ornaments from Arcy-sur-Cure might imply Neandertal symbolizing behavior, but then again might also be something learned from or fabricated by modern *Homo sapiens* neighbors.

*Art.* It seems almost blasphemous to argue that most of the spectacular art of the Upper Paleolithic is irrelevant to the origin of modern *Homo sapiens* and complex language, but its late occurrence well after 35,000 BP in the region where unquestionably modern *Homo sapiens* is last identified makes it an afterthought or addendum to modern human origins.

Lower and Middle Paleolithic art is as rare as the earliest ornaments, but the evidence is accumulating, both within and outside Europe. The earliest known depiction of the human form is from the Acheulean site of Berekhat Ram, Israel, and predates 230,000 BP (Goren-Inbar, 1986). A female form was detailed by altering the surface of a scoria pebble, which is the only piece of that material recovered from the excavations (Fig. 8). It shows exaggeration of the female form, similar in that regard to Upper Paleolithic figurines from Europe. Another early art object is a mammoth tooth carved into a plaque and covered with red ochre from the Middle Paleolithic site of Tata in Hungary [dating to approximately 100,000 BP (Schwarcz, 1982)]. Various other engraved pieces have been found in Middle Paleolithic context, including the notched bones and engraved capstone found with the La Ferrassie Mousterian burials (Peyrony, 1934; as discussed by Simek, 1992). Simek (1992) equates the La Ferrassie materials artistically with the earlier Upper Paleolithic art, and suggests that the frequency of art did not change significantly until after the Aurignacian. Chase and Dibble (1987) regard the pre-Upper Paleolithic art as demonstrating an esthetic sense, which is also reflected in the use of exotic materials to make ordinary tools, and the examples of hominid-collected shells and fossils found in Lower and Middle Paleolithic sites. But they question whether the art preceding the Upper Paleolithic was linked to symbolism, as most of it is not representational.

Marshack (1976a,b, 1989, 1990, 1992) takes the broadest perspective on the symbolic nature of the earliest art. He recognizes symbolism throughout the record and argues for continuity in symbolic design motifs (such as zig-zags and random dots) from the Lower and Middle Paleolithic to the Upper Paleolithic in Europe. Davidson and Noble represent the opposite position, rejecting all claims of symbolism before the Upper Paleolithic because the objects do not appear to have non-utilitarian functions or display recognizable, repeated symbols in the pre-Upper Paleolithic context (Davidson, 1991; Davidson and Noble, 1989; Noble and Davidson, 1991). (It will be interesting to see how they interpret the Acheulean human figurine from Berekhat Ram.)

The record for symbolism preceding the origin of modern *Homo sapiens* is scant and subject to further taphonomic assessment that may demonstrate questionable "objects" are the result of natural processes. Still, there is sufficient evidence suggesting the development of some form of symbolism in *Homo erectus*, Neandertals, and other archaic *Homo sapiens*. The most definitive evidence for symbolic behavior begins with archaic *Homo sapiens* in the Middle Paleolithic with the use of the human body as a symbol that is given burial treatment. Most studies that criticize the evidence for symbolism in ornamentation and art preceding the origin

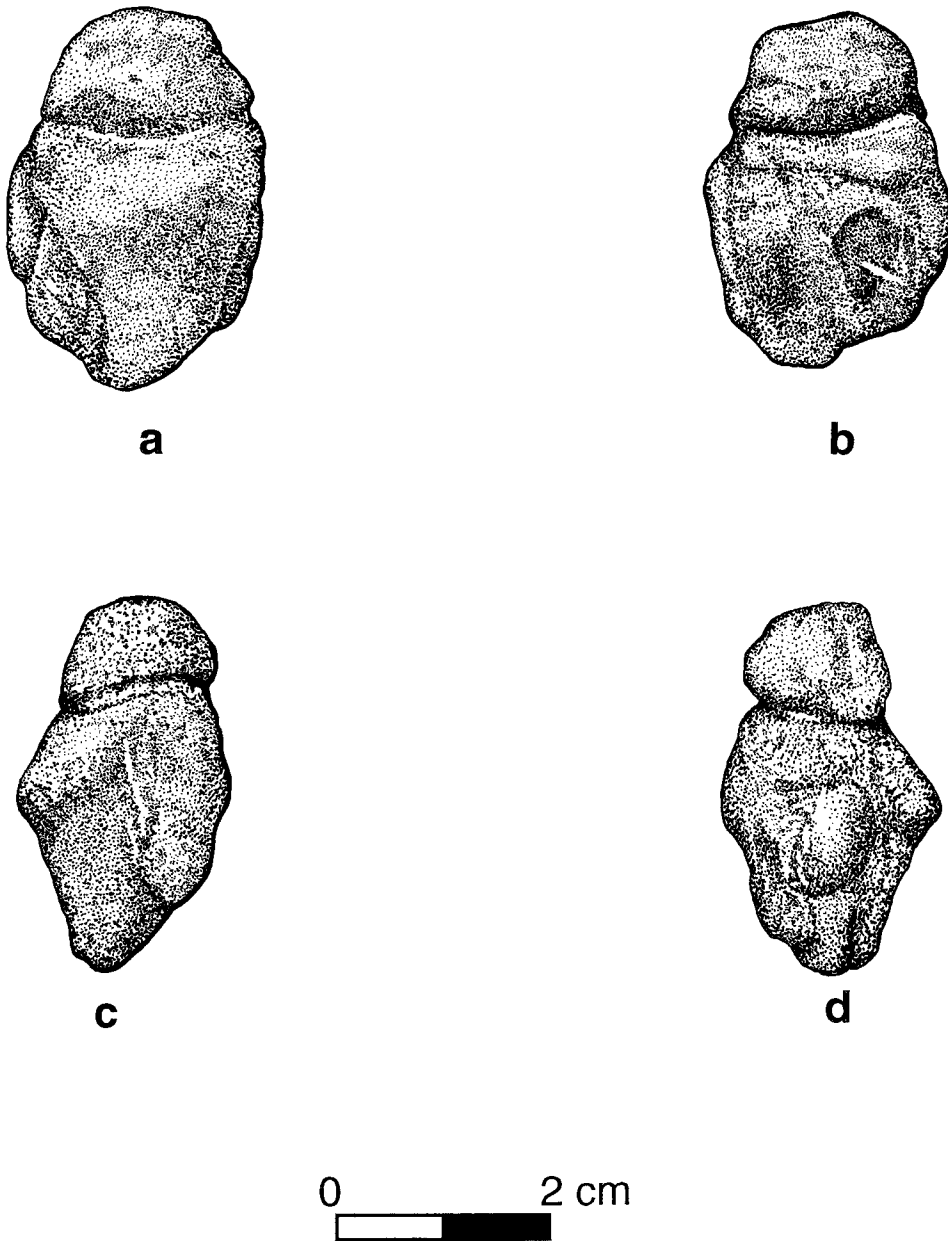


Fig. 8. A scoria pebble female figurine from the Acheulean site of Berekhat Ram, Israel. **a**: front; **b**: back; **c**, **d**: side views. Redrawn from Goren-Inbar (1986) with the permission of the Israel Prehistoric Society.

of modern *Homo sapiens* (Chase and Dibble, 1987; Davidson and Noble, 1989) base their skepticism upon the *lack of patterning, representation, and convention* in the archaeological record of art prior to the Upper Paleolithic. There are several shortcomings in that approach. First, it uses the Upper Paleolithic of Europe as the primary basis for comparison. The earlier periods are largely evaluated in terms of

what is lacking rather than the evidence presented (Bar-Yosef, 1988). The comparison is also biased because the Upper Paleolithic record represents a smaller block of time and geographical space and is the product of more intensive archaeological investigation. Second, without knowledge of the social context, we cannot determine whether designs are representational (and therefore symbolic, according to some researchers). We can only judge whether they are recognizable by our own terms.<sup>7</sup> We also cannot know whether body ornamentation was used to distinguish individuals within social groups or to distinguish social groups from each other. If ornamentation was used to create social persona within a social grouping, we would expect less regularity in its use and its form of expression. While patterning and convention may be important when ornaments are used to communicate group identity, it may not necessarily be the case when ornaments are used for individual identity. Patterning, representation, and convention are clearly components of style in late Upper Paleolithic art, as discussed by Conkey (1978) and Gamble (1982). Their "explosion" in the Upper Paleolithic may simply reflect a local European change in the use of body ornaments and art (see also Belfer-Cohen, 1988; Gamble, 1980; Marshack, 1989), perhaps to emphasize group identity, that arose due to factors other than the dramatic one proposed by White (1989) and others—the arrival of modern *Homo sapiens*. For example, Hayden (1992) argues that technological and economic changes in food-processing and storage associated with a shift to a complex hunting and gathering lifestyle could explain the Middle/Upper Paleolithic transition in Europe, rather than substantial cognitive, behavioral, or biological changes.

#### CONCLUSIONS

The preceding sections on the evidence for the evolution of complex language provide no support for the hypothesis that complex language is an autapomorphic condition for modern *Homo sapiens*. None of the categories of evidence examined here links complex language exclusively with modern *Homo sapiens* or with *Homo sapiens* origins. For both external and internal aspects of complex language, there are data suggesting that Neandertals and/or other archaic *sapiens* were capable of speech, cognition, and symbolism at the level of early modern *Homo sapiens*. Indeed, according to analyses of the brain, vocal tract, intrasite variability, and art, aspects of complex language were developed early in hominid evolution, with some evidence for language abilities beginning with the evolution of the genus *Homo*.

If there was a significant change in language abilities with the origin of modern *Homo sapiens*, it leaves no trace in the aspects of the paleoanthropological record examined here. Specifically, there are no data suggesting any major *qualitative* change in language abilities that corresponds to either 200,000–100,000 BP (the suggested earliest date for modern *Homo sapiens* origins proposed by single origin models) or 40,000–30,000 BP (the suggested date for the appearance of modern *Homo sapiens* in Western Europe).

The proposed quantitative shift or "explosion" in the use of ornamentation and later art during the European Upper Paleolithic (cf. White, 1989a,b, 1993) is a continuation and intensification of a symbolic capacity that is evident for earlier populations of hominids. This shift in the frequency of symbolic evidence marks a change in the *use* of symbolism (rather than its evolution) for a limited geographical region (Belfer-Cohen, 1988; Hayden, 1993; Marshack, 1989) that is unrelated to the origin of anatomically modern *Homo sapiens*. A similar argument for a cognitive and symbolic "explosion" can be made for the development of burial treatment by the Middle Paleolithic peoples of Europe and the Levant—another prehistoric tradition that persists to the present.

<sup>7</sup>The interpretation of art relies on either the recognition of symbols or the imposition of another symbolic system on the image. In Australia, the study of traditional arts where living artists try to explain the symbolism of their work illustrates how misleading the identification of supposedly "representational" symbols can be (A. Thorne, personal communication).

Two major biases lead to the proposed linkage between complex language and modern human origins that has been examined here. The first is the overwhelming "linguicism" of modern humans. As complex language presently distinguishes us from all other living species, it is difficult to imagine that complex language was not the central factor leading to the development of the species. Yet the linkage of complex language and modern human origins is vitalistic in nature. It is an explanation that actually explains little or nothing about the origin of modern humans and the role of Neandertals and other archaic *sapiens* in hominid evolution because it has no factual paleoanthropological basis, as presented here, or because it is conceived in terms that make it untestable.

The second bias leading to the linkage between complex language and the origin of modern humans is "Eurocentrism," because the debate over language and modern human origins is fundamentally a debate over the European Neandertal question and how to distinguish archaic *Homo sapiens* from early modern humans based on European criteria. For example: How can early modern people in southern Africa look so modern but show such archaic behavior? (Klein, 1989a)—i.e., why don't they rely on bone tool technology like their European modern counterparts? How can Neandertals "look" so different but act so much like the early modern *Homo sapiens*? So far, there is little to no behavioral evidence that clearly distinguishes the "Neandertals" from the "early modern *Homo sapiens*" in the Levant or Europe. Mellars (1989a:378) admits that "there is now unmistakable evidence that the final Neanderthal populations in Western Europe were behaving in a way which—by most conventional archeological criteria—was entirely Upper Paleolithic not only in a basic technological sense but also in at least some spheres of cognitive or symbolic expression." Yet it is clear that Mellars views the European Chatelperronian-using Neandertals as "acculturated" peoples, somehow still distinct from modern humans, who could not develop modern behavior independently for "so far, we have no evidence for fully representational art in Châtelperronian contexts, no ceremonial burials, and very little evidence for such features as the organization of subsistence activities, population densities, or the character of local social or residential groups. It is arguable, therefore, that in certain fundamental social, economic or cognitive respects the Châtelperronian groups were still appreciably 'simpler' or less 'advanced' than the contemporaneous populations of anatomically modern humans. All that one can demonstrate from the available archeological data is that there was nothing in the inherent biological makeup (either physical or mental) of the latest Neanderthal populations that prevented them from adopting many of the basic technological features which are conventionally regarded as the hallmarks of fully modern populations" (Mellars, 1989a: 378, emphasis added). Based on the evidence reviewed here, any distinction between late Neandertals and early modern humans in Europe should not have complex language as its basis.

The *capacity* for complex language was a part of the hominid adaptation for a very long time. Differences in the use of complex language and its relative importance for the construction of social life as discernable in the paleoanthropological record have changed over the course of evolution, but the actual capacity for both the external and internal aspects of complex language cannot be used to make distinctions between species of the genus *Homo*.

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