Communication and Human Uniqueness

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Abstract Modern human communication is dominated by language, an extremely unusual mode that appears to be intimately tied to our equally unusual symbolic form of thought as well as to our unique speech apparatus. Some view language as gradually acquired under natural selection, others as a sudden and recent acquisition. The disagreement arises because language leaves no direct traces in the material record, and anatomical proxies for speech such as cranial base or hyoid architecture have proven equivocal. Similarly, even sophisticated Paleolithic stone tools cannot be taken as proxies for symbolic thought, as cognitively complex as their makers may have been. Unequivocal evidence for symbolic thought—and by extension, for language—is only found in overtly symbolic objects, which first occur significantly *after* the appearance of *Homo sapiens*. This suggests that the biological substrate for symbolic thought resulted from the major developmental reorganization that gave rise to our anatomically distinctive species, but that the new potential was not exploited until it was exaptively released by a cultural stimulus, plausibly the invention of language. By this time, the vocal apparatus necessary for speech was already in place.

Keywords Communication • Human evolution • Language • Symbolism

1 Introduction

All primates are social, even if they are not gregarious. And therefore they communicate. Primates have many means of communication: vocal, postural, olfactory, gestural, and (among catarrhines) through facial expression. We human

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beings use all of these modes of communication, although we place a premium on our vocal abilities. Or at least, we think we do. In reality, much of what we communicate is conveyed through body language, manual gesture, and facial expression. Most of what is expressed in this way is, however, emotional content: feelings and reactions of the kind shared with our living primate relatives, and presumably also with our now-extinct predecessors. And the reason we think of our communication as being overwhelmingly vocal is that our vocalizations, or at least, the symbolic meanings they represent, have uniquely been co-opted into the way we process information about ourselves, about each other, and about the world beyond: literally, into the way we think.

As a result of our long evolutionary history we share almost all of our attributes with a widening circle of organisms, and this is as true of our basic communication and interaction systems as it is of the nucleic acids that bond us to all other living organisms, or of the body structure that tells us we are tetrapods, or of the clever hands that make us higher primates. But, as is also true of every other species, we nonetheless possess features that make us different. To the eye, the most obvious of our unusual features are those directly related to our odd form of upright bipedal locomotion: the large, short-faced head, balanced precariously atop a vertical spine; the long legs and short, broad pelvis; the strange, stiff feet. Still, although our bizarre form of carriage has freed our grasping hands to allow us to develop and practice the dexterousness that is so essential to our adopted lifeway—without which we could never have become the kind of creature we are—it is not our weird body structure that gives us our acute feeling of alienation from the rest of the living world, our sense of being so *different* from everything else. It is the way we process information in our minds.

This is not to disparage the intelligence of other animals. It is perfectly possible to be very complex cognitively without dealing with knowledge in the particular way we do. But as far as we can tell, all other living organisms react more or less directly to the stimuli that impinge on them from the outside world, even if those reactions may be mediated in very sophisticated ways that involve multiple stored memories. In contrast, modern human beings literally re-create that world in their minds: So much so, that much of the time we live in the world not as it literally is, but as we have reconstituted it in our heads.

We are able to do this because of our symbolic faculty, our ability to deconstruct our inner and outer worlds into a vocabulary of symbols. Once this is done, we can shuffle those intangible symbols around, according to rules, to create new possibilities in our minds and to imagine things that we have never seen or otherwise experienced. Of course, our close relatives the bonobos and chimpanzees are highly complex creatures that can also recognize verbal and visual symbols (see Jensvold, this volume); they can combine those symbols in an additive way to make and to respond to simple statements such as "take … red … ball … outside." But there is a limit to the complexity or the creativity of any statement made by simply adding symbols in this manner; and, no matter how extensive the undoubted behavioral similarities between us and them, it is obvious when all is said and done that a chimpanzee's apprehension of the world is very different from our own.

2 Biology of the Human Capacity

The neural underpinnings of our capacity to manipulate symbols in an intricate fashion—what Marshack (1985) neatly termed "the human capacity"—are poorly understood. The notably large size of our brains has something to do with it, of course. But it is not the whole story, since as we shall see you can have a large brain and not be symbolic in the human sense, or at least not leave any evidence of being so. What is more, among individuals of *Homo sapiens* brain sizes vary hugely without any correlation to intelligence, however measured (Holloway et al. 2004). The volumes of our vast, globular cranial vaults are thus poor proxies for the functioning of the brains inside them. What is more, the same may be said for all other aspects of our bony structure—including the inner contours of the skull vault, from which endocasts representing the external morphology of the brain can be made. Paleoneurologists have debated the significance of variations in fossil endocast morphologies for years (Falk 1992; Holloway et al. 2004), without reaching any consensus. Such speech-associated and externally visible brain areas as Broca's cap have been identified in some very ancient members of the genus *Homo* (e.g., Walker and Leakey 1993); but it remains highly arguable whether the presence of such structures is in itself indicative of language, or even of speech. Most likely, they simply form part of a much larger complex of structures and interior brain connections that are all involved in the production of normal speech: They need to be there if you are going to speak, but do not by themselves indicate that you possess speech.

3 History of the Human Clade

Members of the quite speciose genus *Homo* have had the same tall, upright-striding basic body anatomy for at least the last 1.6 million years (Walker and Leakey 1993)—although there was a significant shift to lighter and slenderer build at the origin of our anatomically distinctive species *H. sapiens* (Tattersall 2012). The most striking osteological changes among Pleistocene hominids belonging to our clade (roughly, those living during the past two million years) occurred in the skull, as average sizes of the cranial vault grew and faces became reduced and less prognathous, eventually to become retracted under the front of the braincase as ours is today. The archeological record makes it clear that the expanding brain is telling us, in some way, about how hominids became, in a very general sense, more intelligent—perhaps "cognitively complex" is a better term—over the course of the Pleistocene. But unfortunately, it does not tell us anything very specific about how this quality developed, or how it expressed itself at any particular juncture in human evolution. What's more, it tells us nothing about precisely how our own particular lineage of hominids became more cognitively complex. This is because brain enlargement over time was actually a property of the entire genus *Homo*, having taken place independently within the genus in at least three separate lineages (the ones leading to *H. sapiens* in Africa, to *Homo neanderthalensis* in Europe, and to late *Homo erectus* in eastern Asia).

Putatively more informative than the cranial vault is the base of the skull, which also happens to be the roof of the upper vocal tract. As such, the skull base can at least potentially tell us something about the range of sounds early hominids used in their vocal communication (Laitman et al. 1979). It was even thought at one time that cranial base morphology might reflect the moment at which our forebears became capable of modern speech, something that in turn might relate to critical aspects of their cognitive potential. Here is how the reasoning went. The larynx (voice box) is a critical structure in modulating the column of air that generates the sounds we use in speech today. During the developmental period in which modern human infants begin to learn how to speak, the larynx moves from a position high up below the cranial base, behind the oral cavity, to a lower position in the neck. At the same time, the bony cranial base, which starts off as a flattish plane, becomes progressively more concave as maturity is achieved. In apes the cranial base stays flat throughout life, and the larynx remains high. So, in theory at least, the amount of cranial flexion in a fossil hominid skull will tell you the degree to which the individual involved was able to produce the sounds that are essential to producing language (Laitman 1984). In the event, though, it turned out that basicranial flexion among fossil hominids is wildly variable, although full flexion is typically only achieved in anatomically modern *H. sapiens*. Many Neanderthals, for example, turned out to have flattish cranial bases, arguing against their ability to produce the formant frequencies used in speech. Awkwardly, though, others turned out to have a noticeable degree of flexion, leaving the issue in question.

As it became obvious that the cranial base would remain an area of contention, many paleoanthropologists began to hope that fossil evidence of the larynx itself would help decide the matter. But when a Neanderthal hyoid bone, part of the largely cartilaginous laryngeal apparatus, was finally found (Arensburg et al. 1989), it turned out to be very similar to that of a modern human. Similarly, it was later discovered that archaic Neanderthal relatives from Spain possessed a middle ear apparatus that was able to process the range of sounds that we use today in speech (Martinez et al. 2008), a finding that was taken as *prima facie* evidence that these hominids could potentially speak. But there is a continuing problem with evidence of this kind, analogous to the one encountered with the discovery that Neanderthals possessed the modern variant of the FOXP2 gene, malfunctions in which impede the production of speech: (Krause et al. 2007). Because while, in all these cases, the modern conformation may be *necessary* for speech production or comprehension, in none of them can its possession be considered a *sufficient* condition for inferring speech—or, by extension, language. What is more, it has recently been persuasively argued (Lieberman 2007) that approximately equal proportions of the vertical and horizontal parts of the upper vocal tract are required to produce the sounds of speech; and this is a requirement that is basically fulfilled among fossil hominids only by early members of our species *H. sapiens*.

4 Archeological Evidence

Anatomical proxies for cognition and language have thus so far proven something of a disappointment as a means of pinpointing when speech and language appeared in our lineage. For more reliable putative indicators of language use by extinct hominid species, we thus have to turn to the archeological record. This furnishes us with the tangible evidence for early hominid behaviors, at least following the first deliberate manufacture of stone tools at about 2.5 million years ago (Semaw et al. 1997). Comparative evidence of primate and particularly of ape vocalizations (discussed by Tattersall, this volume) suggests that ancestral hominids already possessed a rich vocal repertoire, which was undoubtedly supplemented in the context of communication by the gestural and body language components mentioned at the beginning of this essay. The resulting complex ancestral substrate gives us a starting point as we begin to seek archeological indicators for the evolution of communication systems, and eventually for the appearance of language, in the human lineage.

Before looking for proxies for language in the archeological record, though, it is important to emphasize that language is a very special form of communication and that it is not simply a more complex extrapolation of whatever it was that preceded it in this role. This is because language is intimately associated with the symbolic faculty to which I have already referred. Words are symbols; and indeed, language maps very closely on to thought as we experience it today. For, while thought may additionally have a strong intuitive component, its expression is entirely dependent on moving around those intangible symbols. It is virtually impossible to conceive of symbolic thought in the absence of language, and vice versa.

It is a truism that language per se does not preserve in the Paleolithic archeological record. Prior to the advent of writing systems, nothing in archeology records anything about phonology, or about syntactic capacities. But the mutual interdependence between symbolic thought and language does allow us to seek significant Paleolithic proxies for language in the form of overtly symbolic objects. And it turns out that such items show up in the material record at a remarkably late date. What is more, their appearance also announces a very significant change in the tempo of technological innovation: A change so radical that it strongly implies a fundamental shift in the way in which the hominids concerned were processing information in their minds.

For the first 2.4 million years of the archeological record, significant technological innovations were both highly sporadic and rare (Tattersall 2008, 2012). There was a million-year wait before the production of the initial Mode 1 stone tools began to be supplemented by that of Mode 2 implements; and it was as long again before Mode 3 stone-working techniques appeared (Klein 2009). Throughout this long period, nothing was produced that can convincingly be interpreted as the product of a modern symbolic human sentience. Beginning about 400,000 years ago, during the tenure of *Homo heidelbergensis*, more elaborate technologies appear. These include such sophisticated activities as the hafting of stone tools, the construction of free-standing shelters, and the routine use of fire. But, sophisticated as those behaviors were, none of them can be taken alone as convincing proxies for the workings of symbolic minds.

The same is even true for the productions of the highly encephalized *H. neanderthalensis*. As members of an incredibly egotistical and egocentric species, many paleoanthropologists have over the years had difficulty in believing that it is possible for a big-brained hominid to be sophisticated and cognitively very complex, yet not like us. As a result, it has regularly been proposed that one or another putatively Neanderthal artifact reflected an essentially modern sensibility. Recent studies have, however, cast huge doubt upon the actual association of the most convincing such items with *H. neanderthalensis* (Bar-Yosef and Bordes 2010; Higham et al. 2010). And, once such things are removed from contention, there is little remaining to suggest any symbolic component in Neanderthal behavior. Even burial of the dead, which Neanderthals occasionally and with great simplicity carried out, probably implies nothing more than that these hominids possessed (in common with chimpanzees, as well as with us) a sense of empathy in addition to complex intuitive cognition.

Perhaps more remarkably yet, the same may be said of the rather sketchy archeological record that accompanies the earliest *H. sapiens* fossils known. These come from sites in Ethiopia between 200 and 160,000 years old (White et al. 2010; McDougall et al. 2005), and the associated artifacts are remarkably archaic (Clark et al. 2003; Klein 2009). So much so, indeed, that we can conclude with some confidence that the first members of our species functioned cognitively on a level broadly comparable to Neanderthals. It is not until anatomically recognizable *H. sapiens* had been around for close to 100 millennia that we begin to pick up any overt archeological evidence for symbolic activities.

5 Origin of the Human Capacity

At about 100,000 years ago, the piercing and ocher-staining of marine tick-shell "beads" at sites in Africa and nearby (Bouzouggar et al. 2007; d'Errico et al. 2010; Henshilwood et al. 2004; Vanhaeren et al. 2006) appears to announce the advent of bodily ornamentation, a practice universally associated in historically documented societies with status, social role, and other symbolic issues. And for more overtly symbolic artifacts the wait is not long. By a little under 80,000 years ago, plaques engraved with deliberate geometric designs (affirmed as symbolic, rather than as mere doodlings, by their repetition at different Middle Stone Age sites) had begun to appear in South Africa (Henshilwood et al. 2002; Texier et al. 2010). At around the same time, complex technologies requiring elaborate forward planning appeared (Brown et al. 2009), and the tempo of technological innovation changed dramatically. From this point on change itself, previously very rare, became the norm. Something cognitively radical was stirring among those Middle Stone Age humans, and it clearly involved the mental manipulation of symbols. Once the new mind-set had become entrenched, *H. sapiens* emerged definitively from Africa, rapidly replacing resident hominid species throughout the Old World. By

40,000 years ago, cave artists in Europe were producing some of the most powerful art ever made: the most eloquent testimony possible to the arrival of the modern human sensibility (White 1986).

What does this sequence of events imply for the emergence of language? Language is at base a biological property; and almost certainly, its enabling biology was acquired at the point when *H. sapiens* emerged as an anatomically distinctive entity some 200,000 years ago. The new skeletal structure then acquired speaks to a major developmental reorganization, presumably due to a change in gene expression that had major cascading consequences throughout the structures of the body. Plausibly, these would have extended to the brain, introducing a new cognitive potential for symbolic thought that, among other things, involved enhanced association capabilities in the neocortex. However, this new potential evidently lay unused for a short but significant period of time, until it was realized through the action of what was necessarily a cultural stimulus. And, given the intimate relationship between thought and language, that stimulus was very plausibly the invention of the latter, something we already know can happen spontaneously among members of a biologically enabled species (Kegl et al. 1999). What is more, if this event took place in a population of anatomically modern *H. sapiens*, the individuals concerned would have already possessed the peripheral vocal apparatus necessary to express articulate language, having acquired it in some other context entirely.

If this scenario is correct, we can eliminate the intrinsically implausible possibility that, as many have liked to believe, language and symbolic thought were slowly driven into existence, over the eons, by the action of natural selection on a central hominid lineage (Tobias 1991; Deacon 1997; Holloway et al. 2004). Instead, we can look for the origin of our altogether unprecedented cognitive capacities (as of our ability to speak) in a routine evolutionary event of exaptation. In other words, we can look for the origin of symbolic thought and language jointly, in the co-option of already existing anatomical systems to a radically new use. There is nothing particularly special about this. Ancestral birds, for example, had feathers for many millions of years before using them to fly, while tetrapod ancestors acquired their limbs in the oceans, long before using them to drag their bodies up on land. In other words, remarkable as we may justifiably pride our species *H. sapiens* on being, in evolutionary terms the process that produced us was an entirely ordinary one.

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