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When and Why Did the Human Self Evolve?

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The construct of self is central to psychology and allied disciplines. This construct has captivated and enchanted philosophers and scientists, religious and political figures, writers and poets. The self has been hailed as the basis of motivation, emotion and behavior, and has also been heralded as the key to a deeper understanding of human nature. At the same time, the self has been mystified as enigmatic and fleeting, and has also been vilified as a direct route to personal miseries and societal woes.

Given the increasing relevance of natural selection principles in psychology, it is not surprising that a construct as multifaceted and influential as the self has begun to attract the attention of those psychologists who are interested in the evolutionary origins of various human psychological attributes (e.g., Gilbert, Price, & Allan, 1995; Leary & Buttermore, 2003; Sedikides & Skowronski, 2003). These psychologists conceptualize the human self as a trait that evolved in response to the environmental pressures that drive natural selection.

However, whether this conceptualization is likely to bear fruit is the subject of some debate. This debate is driven by the realization that our knowledge base concerning the conditions that influence the early evolution of humans is still thin. Consequently, one must make a number of plausible suppositions in an attempt to use principles of natural selection to understand the evolutionary origins of the self. For some researchers, such speculation—no matter how informed—is futile, and even potentially misleading. This is particularly true for those selection pressures, such as social organization, that leave only faint physical traces. For example, Bahn (1990, p. 75) argues: “I hate to break the news, but social organisation *is* unexcavatable, when the best one can hope for is a hypothesis based on inference and analogy … In fact it is quite possible that all the interpretations of Palaeolithic life yet put forward are hopelessly wrong, and in any case we shall never know which of them are correct.”

However, other researchers believe that the generation of informed speculation facilitates, and may even be necessary to, the development of an understanding of how evolution has shaped human psychological characteristics. As noted by Quiatt and Reynolds (1993, p. 262): “Anthropologists who have managed perfectly to subdue their imagination make dull company. Only informed speculation can give us a sense of how our society evolved."

In this chapter we side, rather unapologetically, with the latter of the two debate camps. After all, evolutionary theorizing and hypothesis-generation pertain to the design and functions of psychological attributes rather than ancestral conditions. We use our current understanding of the self and combine it with the work of paleoanthropologists, primatologists, archaeologists, and archeolinguists to offer informed speculations about the evolutionary origins of the self. These speculations will include consideration of facets of the self that may have been subjected to the pressures of natural selection, why those facets might have been selected, and when (in evolutionary time) these self-facets may have begun to evolve. We conclude the chapter with a description of some of the empirical implications of these ideas.

Defining and Characterizing the Self

Before we address these evolutionary ideas, however, we would first like to define and characterize the construct, the self, that is the focus of this chapter. We are specifically concerned with the evolution of the *symbolic self*. This term refers to both the ability to consider the self as an object of one's own reflection and the ability to store the products of such reflections (which may be abstract and/or language-based) in memory. We do not claim that the abilities comprising this adaptation are uniquely human. Instead, we accept that, in evolution, an attribute rarely arises *de novo*. That is, evolution generally proceeds by re-working, amplifying, or diminishing existing characteristics. One consequence is that there is often a fundamental continuity between related species. This continuity implies that evidence of the precursors of a symbolic self, or even a rudimentary symbolic self, should be found in other species, especially those that are close to humans on the bush of evolution. Indeed, recent evidence now suggests that higher primates (e.g., chimpanzees, bonobos, orangutans, gorillas) do possess rudimentary forms of a symbolic self-representation (Mitchell, 2003). However, this evidence also indicates that the human self is substantially more complex than the self possessed by other higher primates (Sedikides & Skowronski, 1997; Skowronski & Sedikides, 1999).

A distillation of research that explores the psychology of the self suggests that the human self has three interrelated capacities (Sedikides & Skowronski, 2000). One capacity is *representational*: The self serves as the repository of mental structures that store and organize self-relevant information. These self-relevant representational structures can be concrete or abstract, negative or positive, and can depict the past (e.g., autobiographical memories), present (e.g., how our writing of this chapter is currently going), or future (e.g., aspirations and possible selves). The representations can also include meta-cognitions (e.g., ideas about how others perceive one's behavior), information referring to dyadic relationships, information about one's position within the group, and information about intragroup dynamics and intergroup relations. Furthermore, the representations might contain attributes that can be: (1) unique and distinct from attributes that characterize related others or ingroup members (*personal self*), (2) shared with a related other (*relational self*), or (3) shared with the ingroup (*collective self*) (Sedikides & Brewer, 2001).

The second capacity of the self is *executive* and involves the regulation of its relation with the social and physical environment. Three classes of motives play a crucial role in guiding this capacity (Sedikides & Skowronski, 2000; Sedikides, Skowronski, & Gaertner, 2004): *valuation* (i.e., protecting and enhancing the self), *learning* (i.e., pursing a relatively accurate image of the self, improving skills and abilities), and *homeostatic* (i.e., seeking and endorsing information that is consistent with the self). We will discuss these motives at length later in the chapter.

Finally, the third capacity of the self is its *reflexivity*, defined as the organism's ability to depict itself in its ongoing relation with other objects. Reflexivity is manifested in the interplay between the representational and executive capacities. For example, reflexivity allows the organism to alter long-term goals and render them congruent with anticipated environmental changes. Because of this reflexive capacity, the organism can respond flexibly and dynamically to environmental changes, such as alterations in social contingencies by selectively activating or de-activating portions of stored self-knowledge. More generally, the interplay of the representational, executive, and reflexive capacities allows the organism to process information in a way that is detached from the immediate environment, travel mentally in time, imagine and contemplate the future, simulate the consequences of own actions, and take preparatory steps for what might come as well as reparative measures for what has come. The interplay of these three capacities accounts for much of what it means to be human. We will elaborate on features of this interplay in the second half of the chapter, where we consider the evolutionary significance of the motives that influence the executive self.

A Timeline of Human Evolution

Having addressed definitional issues, we now turn to the consideration of a timeline for human evolution. The construction of such a timeline serves as a context that greatly facilitates one’s ability to locate the emergence of the human self. However, the proposal of such a timeline is a tricky business. Successive paleoanthropological discoveries necessitate the continuous updating of timelines and speciation patterns. Indeed, evidence that has been reported since we previously reviewed the timeline of human evolution (Sedikides & Skowronski, 1997) prompts us now to update and refine that timeline.

While change might appear to be gradual on geologic time scales, when considering smaller time slices evolution often proceeds in series of fits and starts in which change is disorderly and non-linear (Caporael, in press; Klein, 1999; Klein & Edgar, 2002; Lahr & Foley, 1998; Leary & Buttermore, 2003; Tattersall, 2000). One reason for this disorderly pattern is that the environmental conditions that drive natural selection often change in a disorderly and non-linear manner. Indeed, human evolution occurred in such a context, with periods of relative stability intermingled with dramatic and global climatic fluctuation. These fluctuations altered climates (from glacial to more temperate and vice versa) and changed ecosystems (from forests to grasslands to deserts). Geological activity (e.g., volcanic eruptions) may have similarly served to alter local climactic conditions, and may have even had global climactic consequences.

As noted earlier, it is commonly believed that this climatic instability critically influences evolution. For example, Caporael (in press) argues:

> “There is not slow gradual progress of a single lineage evolving through time in a stable [environment]. Instead, the evidence indicates changing environments and habitats breaking up. Fragments of populations would become isolated. They might

> speciate from the parent population through gradual selection to a new or changing environment, stay unchanged by following their preferred habitats, or simply become extinct. On the ground, evolution is … the complex responses between climate, biogeography and populations that may fragment, expand and collapse." (p. XX).

In this regard, consider some of the climactic changes that occurred in the context of the evolution of our human ancestors and some of the changes in our human ancestors that are correlated with such changes. Approximately 7 million years ago (mya), the warm rainforests of Africa were populated by a remarkable diversity of apes. Between 6.5-6 mya (end of the Miocene era), an acute temperature drop occurred. Woodland and savannah began displacing rainforest. During this same time, almost all of the Miocene apes went extinct. One surviving lineage, however, is thought to be a common ancestor to contemporary apes and humans (Haile-Selassie, 2001). By 5 mya (with the temperature rising), and with evolution proceeding, diversification in the ape lineages is again observable. One of these lineages was apparently especially well-suited for life in seasonal habitat and for consumption of gritty food. This lineage is thought to have given rise to bipedal apes with relatively small-sized brains relative to body mass, the best known of which are the australopithecines. Indeed, evidence from the most famous australopithecus, Lucy (*Australopithecus afarensis*), reveals a brain only slightly larger than a chimpanzee's.

The australopithecines were specialized for both walking and tree climbing and, consequently, were well suited to life in diverse habitats (e.g., savannah, forest). They had ape-like bodies with cone-shaped trunks and narrow shoulders. They were characterized by substantial sexual dimorphism (i.e., males were bigger than females), suggesting male competition for females and less male parental investment. They also likely had the intelligence for crude tool-making (e.g., wooden implements). The austrolapithecines were also thought to be a relatively social species whose members spent at least some time in the company of other conspecifics.

It is currently believed that *Australopithecus afarensis* spawned at least six species, including *Paranthropus boisei*, *Homo rudolfensis*, and *Homo habilis*. The appearance of *Homo habilis*, approximately 2.5 mya, coincided with a general cooling of the environment, which resulted in another recession of the rainforest and re-emergence of the savannah. It has been argued that the lack of rainforest safety and the ecological demands of the grasslands precipitated the achievement of evolutionary milestones such as the development of simple stone tools (i.e., splintered rocks). There is also evidence that these *Homo habilis* hominids carried their tools from site to site, even when these sites were separated by several kilometers, and reused these tools. Moreover, these tools (Oldowan choppers and handaxes) appear to have had multiple purposes, which included cutting flesh from bones and smashing bones open for the marrow (Potts, 1984). The evidence for tool-reuse and tool-carrying suggests the presence of at least two critical mental capacities. First, *Homo habilis* species members must have been able to anticipate the future. Second, these hominids were capable of some form of meta-cognition, as they would need to cue themselves for remembering where tools were abandoned or hidden and for hiding them in predetermined places. Indeed, the proposal for emergent meta-cognitive abilities among *Homo habilis* is compatible with their slightly larger brain to body size ratio (when compared to the australopithecines), and a trend toward change in their diet, namely increased consumption of meat (Tobias, 1987).

Current reconstructions of hominid evolution suggest that between 1.8-1.7 mya, *Homo habilis* had given way to *Homo ergaster,* which spread out of Africa and by 1 mya had evolved into *Homo erectus*. It is now believed that the latter species was an evolutionary dead-end that later became extinct in Asia (Klein & Edgar, 2002), but we will discuss the two species in combination given the similarities in their anatomical characteristics, cognitive faculties, and lifestyle. *Homo ergaster/erectus* had a less ape-like appearance, with longer legs, a smaller pelvis, a moisture-conserving external nose, and a barrel-shaped chest. Indeed, the body of *Homo ergaster/erectus* had lost the specialization for climbing, was fully adapted for terrestrial life, and was particularly well adapted for life in hot and dry climates. In particular, exposure of more surface area (relative to body mass) for cooling the body and brain likely contributed to effective thermal regulation, whereas the small pelvis facilitated more efficient walking. Additionally, sexual dimorphism decreased, with females getting bigger, suggesting that competition for females decreased while male parental investment increased.

It is likely that meat was a regular component of the diet of *Homo ergaster/erectus* species members. This high-quality nutrition made possible a significant reduction in intestine volume, thus allowing a shift of energy from the gut to the brain. In accord with this reasoning, this species had a large brain (i.e., neocortex) relative to body size. Evidence for a corresponding increase (Jerison, 1973) in the cognitive ability of *Homo ergaster/erectus* is manifested in several ways. First, this species was able to maintain naturally-occurring fires and, by 790 thousand years ago (kya), to start and control fires (Goren-Inbar et al., 2004). Second, the species was able to produce better stone tools. An example is the Acheulean bifaces, an almond-shaped wedge with a point and a butt at each end, which appeared to conform to the designer's mental template rather than to trial-and-error stone knapping. Third, the species displayed unprecedented dispersion patterns. Specifically, *Homo ergaster/erectus* immigrated to many regions of the habitable world (e.g., Middle East, China, Indonesia, and Southern Europe). Fourth, this species was likely capable of at least rudimentary speech. Although there is some dispute about this, it has been claimed that Broca's area appeared approximately 1.5 mya. However, some argue that the increase in the emergence of Broca's area may simply reflect an amplified need for breath control, which was an original function of Broca's area (although precise breathing control is also essential for both speech and singing).[1] At the very least, suggestive evidence of frequent communication (not necessarily using language) exists in the widespread use of fire and the standardization of stone tools.

It may be the case that deliberate nonverbal communication (e.g., pointing, gesturing, facial expression), referred to as *mimesis* by Donald (1991), might also have evolved during this time period. While it is possible that such nonverbal communication was the origin of spoken language, the emerging consensus is that language has vocal rather than gestural origins (Barrett, Dunbar, & Lycett, 2002). Nonetheless, even mimesis requires sophisticated mental capabilities. These include knowledge of: (1) what it is to be communicated (self-reflection), (2) what others know (theory of mind), (3) what others need to know (tactical self-presentation), (4) how one would feel following the communicative message (affective forecasting), and (5) how or whether one would be in a position to control purposefully the message (knowledge of self-regulatory ability) (Gallup, 1997; Hopkins, 2000; Leary & Buttermore, 2003). Regardless of whether it was verbal or nonverbal, improved dyadic and group communication (for, say, hunting or foraging) likely facilitated both dispersion and successful group living. In this regard, it is interesting to note that *Homo ergaster/erectus* lived in larger groups than *Homo habilis*, groups characterized by flexible hierarchies with shifting roles and alliances (Aiello & Dunbar, 1993; Foley & Lee, 1989).

In summary, the larger neocortex in *Homo ergaster/erectus* coincided with relatively sophisticated tool-making and other markers of enhanced performance, suggesting enhanced cognitive abilities (Jerison, 1973), as well as with increasing social complexity and skill (Byrne & Whitten, 1988), thus facilitating efficient food acquisition strategies. We argue that these evolutionary milestones provided the foundation for the mental capabilities that were later combined to produce the emergence of the human self.

Homo heidelbergensis was a descendant of *Homo ergaster* or *Homo erectus*, appearing in Africa around 600 kya. This species is associated with somewhat refined tool production (i.e., the Late Acheulean hand axe) and increased communicative ability (at approximately 500 kya; Mithen, 2000). By 150-130 kya, a lineage of *Homo heidelbergensis* is thought to have given rise in Africa to *Homo sapiens*. At about 130 kya and during a glaciation period, it is thought that a limited population of *Homo sapiens* survived an evolutionary bottleneck (when death rates far exceed birth rates, with a concomitant drastic reduction in the number of individuals who contribute to the gene pool), leaving a relatively small set of approximately 10,000 breeding individuals. This remaining population expanded greatly at the beginning of the interglacial period and dispersed out of Africa to Europe, the Far East, and into the Americas around 70,000 years ago. The fossil record shows sophisticated tool production characterized by considerable variety of form and a high turnover (5-10 kya) of tool types from about 40 kya. This explosion in tool production is considered the signature of a larger neocortex. The fossil record also testifies to sophistication and variation in stone transport, diet, hearths, and built structures. Hunting and gathering techniques seem to have increased in complexity and efficiency, and so did group living and social networking. It is during this time, we would argue, that the modern human self had finally arrived in full.

When Did the Human Self Originate?

While there is general agreement that the human self was certainly in place by 5-10 kya (i.e., within what is effectively historical times), there is not agreement on the time when the human self initially began to emerge in a form that bears resemblance to the modern self. In fact, dating the emergence of the human self has recently generated some controversy.[2] In our earlier work (Sedikides & Skowronski, 1997, 2003), we speculatively placed the origins of the human self in *Homo erectus* (or *ergaster/erectus*, according to the current taxonomy). As noted earlier, this species possessed a large and complex neocortex (manifested, in part, in advanced tool-making and fire control), pursued cooperative hunting with remarkable efficiency, witnessed the emergence of more advanced communicative and, eventually, linguistic capabilities, and demonstrated sophisticated social organization characterized by group stability, flexible social hierarchy, use of home bases for nomadic hunting, and widespread dispersion. We argued that, given the presence of these indicators of sophisticated cognitive abilities, it was plausible to surmise that a rudimentary human symbolic self had begun to evolve during this time.

Leary and Buttermore (2003) have challenged some of the bases of our conclusion. They argue that it is not clear how large or complex the brain needs to be in order to sustain a self, that cooperative hunting is exhibited by both primate (e.g., chimpanzee) and non-primate (e.g., wolves, wasps) species, and that *Homo ergaster/erectus* did not leave behind artifacts (e.g., art, religion, culture) that a researcher would normally associate with the human self. In contrast, Leary and Buttermore placed the emergence of the human (i.e., symbolic or conceptual) self in the late Paleolithic epoch (50-60 kya) as indicated by both the widespread emergence of technological advances (e.g., tools, clothing, housing, boats) and the widespread presence of artifacts (e.g., body adornment, art, ritualistic burial) in the paleoanthropological record.

We believe that debating the issue of origination of the symbolic self is not just a matter of satisfying intellectual curiosity, although this is an important matter. In addition, this debate is relevant to broader questions of how deeply-rooted or central the symbolic self is to the *Homo* species. Is the symbolic self an adaptation that appeared just 50 kya, or, alternatively, has the symbolic self been inextricably linked with practically the appearance of the *Homo* species?

Prompted by Leary and Buttermore's (2003) thoughtful and constructive challenge, we would like to clarify our own position and to question their rationale for providing a date of 50-60 kya for the evolution of the human self. To begin with, our thesis was that only a rudimentary human symbolic self appeared in *Homo erectus* (Sedikides & Skowronski, 1997, 2003)—a thesis acknowledged by Leary and Buttermore. We surmise that this adaptation undertook substantial transformation before it matured into the modern (i.e., *Homo sapiens*) self. Nonetheless, we believe that the evidence supports the earlier date that we proposed for the emergence of the self, and we believe that we can effectively rebut Leary and Buttermore's arguments.

For example, Leary and Buttermore (2003) asked how large the brain needs to be in order to sustain a self. Although we do not have a quantifiable answer to this question, we can respond to this question by weaving together several sources of evidence. The first of these suggests that cognitive capabilities were quite substantial in *Homo ergaster/erectus*. For example, there is a strong relation between intellectual ability and the ratio of brain size to body mass across mammals (Kuhlenbeck, 1973; Macphail, 1982). Given that there is a trend toward increasing brain size relative to body mass as the *Homo* genus moved from the Australopithecines to *Homo sapiens*, it is hard to avoid the inference that intellectual ability was also increasing during that time. This conclusion is especially hard to ignore when considered in combination with the paleoanthropological evidence suggesting that, as time progressed, hominids possessed increased ability to inhabit inhospitable environments, which would increase diversity in food procurement. In addition, the *Homo ergaster/erectus* neocortex enlarged relative to that of *Homo habilis* at a time when tool production, cooperative hunting, communication, and group living also took a great leap forward. These capabilities, in combination, are suggestive of the presence of symbolic information processing capabilities which are the heart of the symbolic self. In reply to such evidence, Leary and Buttermore point out that cooperative hunting exists in species that do not possess a human-like self. Indeed, we would be surprised if it did not exist, as we fully endorse the principle of cross-species continuity in many traits. In reply, we point out that our argument was that hunting in the *Homo ergaster/erectus* period was remarkably more complex and efficient than hunting in the *Homo habilis* period, thus suggesting improvement in underlying cognitive abilities.

An additional thrust of our argument concerned social organization and communication. Evidence suggests that group size began to rise substantially toward the end of the *Homo ergaster/erectus* period (i.e., approximately 1 mya; Aiello & Dunbar, 1993), increasing thereafter at a rapid rate. Living in relatively large groups contributes to the solution of many ecological or survival problems, but it also entails costs and challenges. For example, given the pressing feeding requirement of group members, the length of daily journeys undertaken by large groups can increase relative to those undertaken by smaller groups, thus incurring additional energy and time costs (Dunbar, 2003a); contests over access to and distribution of food can disrupt foraging (Dunbar, 2003a); and the expenditure of energy and time, along with food contests, can contribute to reduced fertility in females and lower birth rates (Bowman, Dilley, & Keverne, 1978). The challenges of group living are also social: Large groups require the investment of large amounts of time in social grooming in order to ensure their cohesion and functionality through times (Dunbar, 1991), which causes problems with adequate allocation of grooming time. Such time demands may necessitate role differentiation and increased structuring of groups (Dunbar, 1984; Kudo & Dunbar, 2001); the necessity for intragroup cooperation might also increase with group size, with the formation of dyadic alliances (Trivers, 1971) and the need to monitor other members' contributions to the alliances, manage free-riders, detect cheaters and oneself exploit opportunities to cheat (Byrne & Whitten, 1988; Cosmides, 1989; Dunbar, 1999), all of which consume cognitive resources. In addition, effectively managing group-related behavior can entail ongoing social rank calculations and the tracking of shifting alliances (Harcourt, 1988), intensification of intrasexual competition for mates (Parker, 1987), and increased intergroup competition for resources (Ghiglieri, 1989).

Consider the mental abilities that would help an organism to navigate the demands of a large, complex, and ever-shifting social context. Effective functioning in such an environment would be facilitated by knowing who might be a “good fit” to one’s own abilities (Tooby & Cosmides, 1996). This ability to predict whether one can effectively interact with others seems to require a good deal of self-understanding. Indeed, the need for such information may have contributed to the formation of a *private self*. In addition, an individual would benefit if he or she were able to perspective-take and know how she or he was perceived by others through reflected appraisal processes. These skills are also important when an individual wishes to present him or her self to other group members in a desirable manner when attempting to form alliances or ingratiate oneself into relationships. Such needs may contribute to the capacity to “know” what people are like and what they might want – in essence, a theory of mind. Beyond this, however, the effective detection of cheating requires a rather advanced theory of mind (i.e., knowing what the potential cheater thinks that I know; Dunbar, 2003b). Such a theory of mind would enable a cheater to manipulate the impressions conveyed to others by deliberately engaging in behaviors that would be seen as differing substantially from prototypical “cheating” behaviors. Thus, the need to effectively navigate the social world may also have contributed to the development of a theory of mind that could be useful in manipulating one’s own behavior via self-presentation – or to the development of what we now call the *public self*.

The social demands associated with group living can be thought of as selection pressures that drive evolution, and, in our view, it is important that such pressures coincided with the presence of augmented cognitive capacities in human evolution. Indeed, in support of this notion, the complexity of social organization is generally correlated with neocortex volume in anthropoid primates. Specifically, five indices of social complexity (i.e., group size, grooming clique size, utilization of social skills in male mating strategies, frequency of tactical deception, frequency of social play) correlate with relative neocortex volume (Dunbar, 2003a). Group size, in particular, correlates strongly with absolute neocortex volume (Dunbar, 2003a).

The implication, then, is that the computational demands of the complex social life of *Homo ergaster/erectus* may have been an important driving force in the evolution of human mental capabilities, selecting for a larger brain—and especially frontal lobe (Dunbar, 2003a). Why the frontal lobe? Self-reflective skills are related to the presence of a relatively large neocortex. Recent research suggests that this area of the brain has emerged as the locus of many processes (e.g., self-awareness, self-recognition, self-reflection) that are vital to a concept of the self (Feinberg, 2001; Kelley et al., 2002; Turk et al., 2002).

The evolution of the neocortex was also accompanied by the evolution of physiological structures necessary for language production (Aiello, 1996) and, hence, implicitly language understanding, since the use of language is itself indicative of a capacity for symbolic reasoning (a capability important to the human symbolic self). Indeed, a complex vocal apparatus and a brain capable of controlling it is one of the special provinces of hominids. In fact, it has even been argued that language drove physiological evolution, conferring advantages to those who were able to produce more complex language sounds (Bickerton, 1981). Regardless, the physiological evidence related to language production capabilities that has been amassed to this point again suggests an earlier rather than later date for the origins of the symbolic self.

As mentioned previously, brain casts have been interpreted as reflecting the emergence of Broca's area as early as 1.5 mya. The evidence that Broca's area was enlarged in the left hemisphere appears to indicate the beginnings of precise vocal control (Corballis, 2003). Moreover, an expanded and lower larynx—which many claim is a physiological necessity for articulate speech—evolved in late *Homo erectus* (McHenry, 1992; Zeller, 1992).[3] Other scholars (e.g., Aitchison, 1996) note that as *Homo habilis* evolved into *Homo ergaster/erectus*, their skulls altered in ways that would allow individuals to increase the variety and intricacy of the sounds they could produce. Examination of skeletons that are increasingly "modern" show a gradual enlargement of orifices in bones that can accommodate the nerves required to control complex speech. This trend begins pre-*Homo sapiens*, which suggests that some rudimentary language capability might also be evolving prior to the emergence of modern humans.

Curiously, there appears to be an interesting paradox in the lower larynx position that apparently accompanies speech. Although it is important to the production of complex speech, the low larynx makes human beings more susceptible to choking than any other species on the planet. From this paradox, some have concluded that, because the benefits of communication seem to outweigh the costs of choking, it is logical to assume that this larynx position is a key adaptation in the origin of language. As Scovel (1998, p. 43) argued: “So the linguistic advantages outweigh the physiological disadvantages of a lower larynx, and if the emergence of language is as vital to our evolutionary history as most anthropologists believe, and if language is so indispensable to our species, it is no exaggeration to claim that the descent of the larynx has permitted the ascent of mankind!”. However, it is possible that such alterations reflected pre-adaptations—changes that occurred for other reasons (e.g., the establishment of a lower vocal range that can strengthen the potency of threatening signals), and only later in evolution were these changes found to be advantageous for speech production (Nishimura, Mikami, Suzuki, & Matsuzawa, 2003). However, such arguments apply primarily to the positioning of the larynx, and can not easily explain the evolutionary timing of the increase in the size of the speech-controlling Broca’s area or the expansion in the size of the skull orifices that accommodate nerves related to speech production. Hence, the constellation of changes in hominid anatomy over time collectively implicate the relatively early evolution of complex vocal communication. This also implies the presence of symbolic thought, a cognitive component critical to the modern self.

Leary and Buttermore’s (2003) date of the evolutionary origins of the self at 60-50 kya was largely based on the emergence of the cultural “big bang” – a period of time in which glimmerings of human “selfness” seems to be evident in art production and ritual burial practices (see also Mithen, 2000). However, if Leary and Buttermore’s dating is correct, then no such evidence ought to exist prior to 50 kya. The record suggests otherwise. Evidence of culture, art, and burial has been generated from archaeological sites that are older, sometimes substantially older, than the Leary and Buttermore date.

At least three lines of evidence can be cited in this regard. The first of these concerns art objects. Recent finds from South Africa, including bone fragments and an engraved nodule of hematite, have now been dated to more than 77,000 years ago (d’Errico, Henshilwood, & Nilssen, 2001; Henshilwood et al., 2002). Additional finds suggest that inhabitants of sites in South Africa and Cyrenaica in the middle Paleolithic period (as early as 100 kya) made use of red ochre and specularite pigments and of seashells that were a by-product of expanded food procurement practices in the production of carved artwork or personal adornment (Clark, 1989, 1995). However, some researchers claim that rock art objects may have an even older history. That is, although the evidence is disputed, some forms of rock art may be substantially older then the dates of the South African finds. For example, Marshack (1997) claimed that the "Berekhat Ram figurine" (a real carved object and not a product of natural forces) can be dated to at least 250,000 years ago. Bednarik (1998) reviewed additional evidence for the early emergence of art, noting that rock art consisting of cup marks and a meandering line hammered into the rock of a sandstone cave was produced in India two or three hundred thousand years ago and that, at about the same time, simple line markings were made on a variety of portable objects (bone, teeth, ivory, stone) in several locations. However, these particular examples remain subject to some dispute as to whether or not they are human-made.

A second line of evidence, related to the production of art, concerns personal adornment. Archaeologists have recently discovered that humans used paint for aesthetic purposes far earlier than previously thought. Specifically, over 300 fragments of pigment were found in a cave at Twin Rivers, near Lusaka, Zambia. This find included pigments and paint grinding equipment believed to date to 350-450 kya (Barham, 2002). The obvious significance of pigments is that they imply ornamentation, which is a sign of self-emergence.

A third line of evidence comes from burial practices. Although true burials (i.e., those associated with grave goods) are not found prior to ca 25 kya, several Neanderthal cave sites dated to 90,000 years ago provide what is considered to be the first plausible evidence of deliberate disposal of the dead (Stringer, Grün, Schwarcz, & Goldberg, 1989). In addition, Clark et al. (2003) reported that modern human crania from the Middle Awash in the Afar Rift, Ethiopia, date to 160-154 kya provided indications of deliberate mortuary practices (such as defleshing and polishing), which would push the date of burial practices back even farther. Moreover, at the early archaic human site of Atapuerca in Spain, there is evidence of the intentional storing of bones (but not necessarily burial) from at least 32 individuals in a cave chamber by as early as 300 kya (although a more conservative date may be 150 kya; Arsuaga, Martinez, Gracia, Carretero, & Carbonell, 1993; Carbonell, Bermudez de Castro, Arsuaga, Díez, Rosas, Cuenca-Bescos et al. 1995; Nieves & Mendoza, 1993). If burial practices reflect a sense of self, as has often been claimed, then here we have additional evidence that puts an evolving sense of self substantially earlier than suggested by Leary and Buttermore (2003).

We also question Leary and Buttermore's (2003) dating on other grounds. Given that language signifies the presence of symbolic or conceptual abilities, if Leary and Buttermore's dating is correct, then no language ought to have evolved prior to approximately 50 kya. Although language probably arose in a series of stages rather than as single phenotypic or genotypic event (Aiello & Dunbar, 1993), it is also believed that language, in a relatively advanced form, had already evolved by 0.5 mya (Dunbar, 2003a). In addition, if language had evolved after 50 kya, it would be difficult to account for its universality across the human species today, since modern humans last shared a common ancestor some time prior to 70 kya when the main dispersal across the Arabian landbridge occurred.

In summary, we have argued on both evidential and logical grounds that the symbolic or conceptual self emerged well before the Upper Palaeolithic era. In our view, Leary and Buttermore's (2003) claim that the emergence of the symbolic self is indexed by the cultural "big bang" around 50 kya is untenable in the face of the paleoanthropological evidence. Indeed, the current view leans more towards the suggestion by McBrearty and Brooks (2000) and others that the Upper Palaeolithic cultural revolution in fact began in Africa some prior to 100 kya. The apparent explosion in Europe after 50 kya may thus have more to do with the fact that modern humans only arrived in Europe, complete with their Upper Palaeolithic culture, some time after 50 kya. Regardless of the fine details of this or any other explanation (such as Tattersall's [1995] language push or Klein's [1999] genetic mutation that caused a reorganization of the brain) for the sudden outburst of cultural diversity in Europe after 50 kya, unless challenged by new evidence, we hold to our thesis that the human self was already substantively in place by the appearance of archaic humans round 500kya, and hence that its first glimmerings may already have begun to emerge by the late stages of the *Homo* *ergaster/erectus* period.

Functions of the Human Self: The Case of Self-Evaluation Motives

What are the functions of the self that might have contributed to its maintenance and propagation? We previously defined the self in terms of the interplay of the representational, executive, and reflexive capacities. In discussing the executive capacity, we referred to three classes of self-evaluation motives: valuation, learning, and homeostasis. We will now discuss the adaptive utility of these motives for the self-system as well as relational living (Fletcher, Simpson, & Boyes, this volume) and group living (Brewer & Caporael, this volume; van Vugt & van Lange, this volume).

These motives influence the acquisition of self-relevant information. Given that maintenance and positive self-change is adaptive, it is not surprising that individuals are particularly sensitive to information that has implications for the self. For example, humans have a nonconscious processing sensitivity for stimuli pertaining to the self, are speedier in the processing of self-relevant than self-irrelevant descriptions, and show a better memory for self- than other-relevant information (Baumeister, 1998). In addition, the self affects the processing of social information. For example, when judging others on dimensions that are central to the self, individuals process the information deeply and draw a large number of rather extreme inferences about others (Sedikides & Skowronski, 1993). Moreover, the self is often projected upon others, especially when levels of ambiguity are relatively high (Green & Sedikides, 2001), and is implicated in the choice of friends or partners (Sedikides, 2003).

Humans, however, are not mere information recipients; they are also information-seekers. Early hominid survival may have depended on the type of information sought and acquired from the environment and on how this information was interpreted and used in judgment and behavior. What kind of information did our ancestors want and need to know about themselves? This is where the three classes of self-evaluation motives, valuation, learning, and homeostasis (Sedikides & Gregg, 2003; Sedikides & Strube, 1997), would seem to be quite useful. The *valuation motives* are self-protection and self-enhancement. The self-protection motive serves to filter out, negate, or discredit unfavorable self-relevant information, whereas the self-enhancement motive serves to filter in, accept, or magnify favorable self-relevant information. The *learning motives* are self-assessment and self-improvement. The self-assessment motive guides pursuit of accurate (unfavorable or favorable) self-knowledge, whereas the self-improvement motive guides pursuit of knowledge that has long-term improvement value. *Homeostatic motivation* is represented solely by self-verification. This motive guides pursuit or endorsement of self-consistent information (negative or positive).

We conceptualize the three classes of self-evaluation motives as prima facie instances of putative modular adaptations, thus assuming that they served specific adaptive purposes (Kurzban & Aktipis, this volume). In the sections below, we will elaborate on how these motives can induce cognitive, affective, and behavioral changes that are adaptive. Moreover, we propose that the motives evolved in response to individual, relational and group adaptive problems, and that they promoted the adaptive utility of the personal self while in the long run benefiting the relational and collective selves by improving the individual's relational and group standing. Finally, once again, we posit that these motives initially emerged in the later *Homo ergaster/erectus* period.

On the Adaptiveness of Self-Evaluation Motives

Numerous adaptive benefits can accrue from the action of the *valuation motives*. Choice of tasks (e.g., hunting, alliance formation, challenge to higher-ranked conspecifics) is a prime example. Valuation motives can influence individuals to avoid tasks with a high probability of failure (and hence, a threat to the self) and to select tasks with a high probability of success (and hence a boost to the self), assuming that expected task utility or fitness effects were comparable in the two cases. It follows that maximum benefit for the self would be produced by selection of tasks that entail an optimum combination of task success and fitness payoff. Additionally, protection or boosting of the self can be achieved by the interaction of valuation motives with the representational and reflexive components, resulting in such processes as forgetting failures and remembering successes, making self-serving inferences, believing in the relative superiority of the self over others, engaging in downward social comparison, and presenting the self favorably to others.

These processes also serve affective functions: The self-protection motive contributes to self-esteem maintenance and the evasion of negative emotions (e.g., disappointment, sadness, frustration), whereas the self-enhancement motive contributes to self-esteem elevation and the experience of positive emotions (e.g., contentment, pride, happiness). These conjectures are supported by research suggesting that a relatively high level of self-esteem and positive affectivity are linked with active engagement in everyday activities, creativity and planning, an optimistic attitude, improved coping, better psychological health (e.g., lower depression, anxiety, and loneliness), and better physical health (Baumeister, Campbell, Krueger, & Vohs, 2003; Fredrickson, 2001; Taylor, Lerner, Sherman, Sage, & McDowell, 2003a, b). Also, high self-esteem and positive affectivity (e.g., extraversion, low neuroticism) can add to an individual's appeal as a mate, thus improving chances of reproductive success. Reproductive success can also be promoted by the virtue of high self-esteem and positive affectivity facilitating dyadic interactions and group-level interactions: Individuals high in self-esteem and positive affectivity are perceived as competent and resourceful, and are thus more likely to be trusted upon for positions of responsibility within the group (Buss, 1989; Hogan, Curphy, & Hogan, 1994; Kenny & Zaccaro, 1983). Consequently, high self-esteem and positive affectivity maximize chances for advancement in the group hierarchy and minimize chances for social exclusion. Both outcomes, then, contribute to reproductive success, as high group status would be associated with successful mating and the offspring of high status members would be less likely to face neglect or social exclusion.

Learning motives, with their potential to clarify and enrich the self, would also have been adaptive to early humans when they led individuals to pursue, choose and construct tasks that are high rather than low in skill diagnosticity (Trope, 1983). Given that high diagnosticity tasks provide a definitive test of whether the organism possesses the underlying skill, they allow efficiency in later choices and time allocation decisions. For example, individuals may purposefully select tasks within particular domains (e.g., hunting, gathering, child rearing duties) that diagnostically assess their abilities to perform well in those domains. The ensuing accurate self-knowledge can be implemented in task planning, thus maximizing person-environment fit. Alternatively, if a deficiency is evident, the individual can either allocate time to alternative pursuits or (e.g., shifting from child-watching to food gathering) or find ways to improve (e.g., practicing, engaging in technological innovation). Finally, individuals can utilize accurate skill knowledge to place themselves in suitable positions in the group hierarchy, thus minimizing disadvantageous conflict with conspecifics. Hence, it seems reasonable to suggest that the learning motives likely promoted reproductive fitness.

In addition, learning motives may have served critical cognitive and affective functions for group members. The self-assessment motive reduces an individual's uncertainty about self-attributes as well as aspects of the social and physical environment. Also, the self-improvement motive elevates an individual's sense of progress. This two-step benefit (i.e., reduction of uncertainty coupled with feelings of progress) contributes to personal adjustment and positive affectivity which (as discussed earlier) facilitate reproductive fitness.

The *homeostatic motive* of self-verification stabilizes the representational aspect of the self through direction of attention to and solicitation of self-consistent feedback, biased (i.e., self-confirming) interpretation of ambiguous feedback, biased causal inferences, biased recall, and the prompting of self-corroborating behavior. Our hominid ancestors may have been prone to selecting tasks likely to confirm their notions of self-competence, a trend also observed in humans today. Also, the confirmation of self-beliefs afforded by task selection may have rendered the social environment more predictable and increased feelings of control over it, thus contributing to feelings of personal efficacy. Such feelings are highly adaptive, as they facilitate wiser decisions about energy expenditure, the setting of self-congruent goals and, more importantly, behavioral change to achieve these goals. These processes maximize outcome success and, in the long run, reproductive fitness.

Reproductive fitness could have been maximized in another way. An individual may have solicited and received confirming feedback from group members regarding social standing, role expectations, and the behavioral repertoire necessary to carry out various roles. Such feedback would help the individual to avoid the energy waste that might accompany pursuit of goals incompatible with group objectives. Moreover, such feedback may also contribute to the warding off of negative emotions (e.g., shame, guilt, embarrassment) and the promotion of positive emotions (e.g., satisfaction, self-efficacy, pride) (Haidt & Keltner, this volume).

It is perhaps important to emphasize here that social integration is a critical feature of all primate (including, obviously, humans) societies. This reflects the fact that primate social systems are implicit social contracts in which individual members need to be willing to delay immediate personal gratification in order to achieve greater advantages in the long term through cooperating to solve the problems of day to day survival. There is evidence to suggest that such tasks are cognitively much more demanding than the more conventional cognitive processing of physical percepts (Kinderman, Dunbar, & Bentall, 1998). The psychological processes that underpin the sense of self may play a critical role in enabling modern humans to integrate and bond their large social groups. And, if so, they may well have played an equally important role in allowing archaic humans to do the same in the somewhat smaller social groups in which they are likely to have lived (Aiello & Dunbar, 1993). These mechanisms can thus be seen as a natural outgrowth of the "social brain hypothesis" (Dunbar, 1992, 1998).

An Integrative View of the Self-Evaluation Process

We propose that self-evaluation motives operated synergistically rather than competitively in the prehistoric environment. That is, we assume that the three classes of motives were dynamically interrelated and served complementary purposes – and continue to do so today. Our evolutionary account emphasizes the modular nature of the symbolic self and the trade-off among different modules (i.e., self-evaluation motives). Nonetheless, we postulate that the self-evaluation process is predominantly guided by the valuation motives (Sedikides & Skowronski, 2000; Sedikides & Strube, 1997; Sedikides et al., 2004). Our proposal is fully compatible with findings attesting to the universality of both valuation motivation (Brown & Kobayashi, 2002; Sedikides, Gaertner, & Toguchi, 2003; Sedikides, Gaertner, & Vevea, in press) and self-esteem (Pyszczynski & Cox, 2004; Pyszczynski, Greenberg, Solomon, Arndt, & Schimel, 2004a, b; Sheldon, 2004).

As an example of the relevance of the valuation motives, consider the interplay between the three motive types in the context of the distinction between *candid* and *tactical* self-enhancement. Candid self-enhancement refers to flagrant attempts to increase the positivity, or decrease the negativity, of self-attributes. This type of self-enhancement is achieved either through behaviors such as brute self-aggrandization (e.g., display of one’s physical prowess) or through denial of wrongdoing (e.g., as when one is caught subverting the status of dominant individuals). Such behaviors can often be directly linked to the action of valuation motives. Tactical self-enhancement, on the other hand, refers to indirect attempts to increase the positivity or decrease the negativity of the self. Tactical self-enhancement is sensitive to the social context and the balance between immediate and delayed rewards. This type of self-enhancement is often guided by the action of the learning and homeostatic motives. An example of tactical self-enhancement would be to restrain from challenging a higher-ranking conspecific or showing downright submission. However, despite the action of the learning and valuation motives in this domain, we see their action as secondary. In our view, the valuation motives generally will play a more important role in controlling the behaviors relevant to self-evaluation.

The affective consequences of the self-evaluation process likely follow a similar pattern of integration, but with the primary guiding role being played by the valuation motives. We speculate that self-enhancement increases self-esteem, self-verification induces feelings of control, self-assessment reduces uncertainty, and self-improvement instills feelings of progress. Although all of these motives are involved in the production of such feelings, we argue that control, certainty, and a sense of progress are critical to individuals because they are linked to the more basic desire for self-protection or self-enhancement.

In addition, we maintain that the self-evaluation process consists of two parts: information and action. Information refers to the generation and testing of hypotheses about the quality of the person-environment fit (e.g., “Am I strong enough to overthrow the higher-ranking group member?”). This part reflects the extent to which the individual’s abilities match situational demands. The resulting data from the hypothesis-testing procedure could be used to carry out candid and, more often, tactical self-enhancement through action (e.g., coalition-building for bringing about change in the dominance hierarchy). Thus, the action component of the self-evaluation process (along with concurrent self-regulatory processes) pertains primarily to opportunistic responses to existing situations or to the strategic creation of new situations that are likely to yield beneficial outcomes or avoid harmful ones. It should be apparent from our discussion that we regard information and action as interdependent. To the extent that information about person-environment fit is veridical, likely to lead to improvement, and is self-verifying, resulting action will have a high probability of success because the individual can now make informative choices about favorable performance domains. Likewise, action success produces feedback about the validity of the behavior in question, the rate of behavioral improvement, and the verifying value of the information on which the behavior was based.

When the person-environment fit is high (i.e., when self-enhancement is carried out effectively through the information and action parts), feelings of individual self-esteem, control, certainty, and progress (as well as positive affectivity, in general) can be heightened. In our view, these self-esteem consequences are likely the most immediate outcome of the self-evaluation process. In addition to being relevant to the self, these feelings can also provide an essential gauge of the utility of the individual’s actions for the group (e.g., Did the group approve of the organism? Was rejection or exclusion a possibility? Should the organism persist along the same path or redirect action, instead?) (Leary & Baumeister, 2000). In turn, the presence of these feelings is likely to increase one’s mate value (Brase & Guy, in press).

Despite the fact that heightened self esteem can be a guide to functional behavior, it is also the case that striving for self-esteem can sometimes lead to a suboptimal adaptive response (Crocker & Park, 2004). This suboptimality can result from a discrepancy between the adaptiveness of behaviors mandated by the information and by the action components of the self-evaluation process. Although we believe that the typical state of affairs is synergy between the information and action parts of the self-evaluation process, antagonism is also a possibility. What happens in these situations?

We suggest that the activation of a particular motive depends on the trade-off between the value of veridical information and its emotional costs. On the one hand, admitting the veridicality of information that pertains to important domains (e.g., being inept at aspects of gathering or hunting tasks), can lead to serious affective consequences (e.g., depression, lethargy, malfunction). On the other hand, neglecting the relevant information through dismissal, denial, or self-deception permits the individual to function with relative efficiency (e.g., perhaps by attempting to hone alternate skills), but could also inflict irreparable damage (e.g., being perceived as a cheater and being forced to eventual social exclusion). This conflict between candid self-enhancement objectives and long-term tactical self-enhancement objectives can assume other forms. For example, willingly giving up control to a more powerful group member may seem maladaptive, because it denotes acceptance of another's superiority. However, control relinquishment can also be an effective or conflict-free strategy for satisfying long-term objectives such as gaining acceptance within a group (Rothbaum, Weisz, & Snyder, 1982). In such cases, a pragmatic cost-benefit analysis or motive prioritization can facilitate a balanced, successful, and, in the long term, adaptive response to a given situation.

Still, which factors influence the activation of particular motives? We argue that motive activation depends on the dynamic interplay between the self-system and the environment. For example, high certainty about a self-attribute would render additional gathering of diagnostic information inefficient. In this situation, the self-assessment motive would be dormant or deactivated, whereas the self-verification motive would become accessible and would guide behavior that likely to confirm the self-attribute under consideration. Consequently, the individual would resist unwarranted self-knowledge changes and the integrity of the self-system would be preserved. Low self-certainty, on the other hand, could activate the self-assessment or self-improvement motive. Such activation would prompt the individual to master the contingencies necessary for informed and fruitful transactions with the environment. Regardless, the long-term demands for veridical, improving, and positively-verifying information might dictate that unflattering information about the self (i.e., one's liabilities in a domain) be uncovered or disclosed in the short run.

The organism's response might also be contingent on perceptions of skill modifiability (Dunning, 1995). An individual might be predisposed to accept accurate feedback (i.e., self-assess) about a skill considered changeable and improvable through practice, but to self-protect by rejecting accurate feedback when the skill was considered unchangeable. Self-protection would be particularly likely following a prior blow to self-esteem, whereas self-assessment would be likely following a self-esteem boost (Sherman & Cohen, 2002). In addition, the organism's response might depend on the availability of cognitive resources (Swann, Hixon, Stein-Seroussi, & Gilbert, 1990). Sometimes an immediately threatening event (e.g., public provocation by another group member) may require candid self-enhancement (e.g., display of physical prowess, vocal denial of the charges, verbal attack of the offensive opponent) rather than a deliberative response (Depret & Fiske, 1993). When the external threat, though, is not pressing (e.g., planning to overthrow and replace an ineffective leader), tactical self-enhancement (e.g., a deliberate and self-presentational build up on one's ability to self-assess and self-improve) can be more appropriate than an expedient response (Cummins, 1996). Finally, social context can influence motive activation. Tactical self-enhancement (e.g., modesty) can be the more sensible alternative when one is accountable for her or his behavior to other group members (Sedikides, Herbst, Hardin, & Dardis, 2002) or when presenting the self to persons familiar with the individual's record (Tice, Butler, Muraven, & Stillwell, 1995).

Evolution and the Valuation Motives: Summary and Recapitulation

In writing and in processing these theoretical ideas, the main thrust of one's argument sometimes gets lost in the technical details of the argument. Hence, we would like to take this opportunity to recapitulate our arguments with regards to evolution and the self motives in a more "bare bones" form. Most central to our argument is the notion that evolution favored individuals with strong valuation motives, with the other motives (learning and homeostatic) playing a role that is generally in the service of those valuation motives, not least because these ensured close integration of individuals within large, complexly organized social communities.

In particular, we propose that the action of the valuation motives conferred three major adaptive advantages. First, these motives promote the adaptiveness of an individual's self-system. These motives are crucial to effective choice behavior and success experiences that had emotional (e.g., self-esteem, self-efficacy), motivational (e.g., active engagement in daily activities, planning facilitation, persistence in the face of adversity), and physical health consequences.

Second, valuation motives improved an individual's ability to engage in social interaction. As mentioned previously (Taylor et al., 2003a, b), valuation motives are negatively associated with mental distress (e.g., depression, anxiety, neuroticism, hostility) and positively associated with both mental health (e.g., high self-esteem, optimism, happiness, feelings of mastery and agency) and physical health or prowess. Mentally and physically healthy individuals are more likely than their distressed and weak counterparts to be seen as likeable, resourceful, and interpersonally attractive. Hence, those with strong (compared to those with weak) valuation motives are considered more attractive to others and are more likely to form positive interpersonal bonds with others. Functional valuation motives, then, are likely related to an individual's perceived mate value and so contributed to their mating success.

Third, functional and active valuation motives enhance an individual's standing in the group. An agentic, mentally healthy, and interpersonally successful group member likely was perceived as someone who is deserving of the group's trust and as someone who could effectively carry out collective tasks. Trust and acceptance promote an individual's chances of moving up in the ranks of a group and of assuming a leadership role. Benefits from such a role would include increased probability of reproductive success and decreased probability of sanctions (e.g., social exclusion, bodily harm) directed either at the individual or her/his offspring.

Epilogue

We set out to accomplish four objectives in this chapter. We began by addressing definitional issues regarding the construct of self. We then offered an updated timeline for the evolution of *Homo sapiens*, taking into consideration recent accounts that emphasize the non-linear and disorderly course of evolution. Next, in the context of that timeline, we discussed when the human self originated. In the course of this discussion, we challenged Leary and Buttermore's (2003) dating of self-emergence in the Upper Palaeolithic era (60-50 kya) on both evidential and logical grounds, and we reviewed evidence that bolsters our previous contention that glimmerings of the human self emerged at the end of the *Homo ergaster/erectus* period. Finally, we considered the functions of the self-evaluation process in the maintenance and propagation of the self and the species, and explored how the various human motives may have worked to enhance the evolutionary functionality of this process. We hypothesized that, while there are multiple motives that work integratively in this process, these motives generally work in the service of the valuation motives.

We believe that a good number of empirically testable hypotheses can be derived from our discussion. One example is the hypothesis that valuation motives enable an individual to cope more effectively with the demanding social pressures (e.g., alliance formation, competition with rivals) imposed by the complex and flexible social world of the human species. Another hypothesis is that valuation motive strength gives individuals direct interpersonal and reproductive advantages by increasing perceived mate value. Still, a third hypothesis is that valuation motive strength is associated with higher ranking in the group and, ultimately, with smoother group functioning. These hypotheses are empirically tractable on several levels. Both behavioral studies (e.g., linking valuation motive strength to adaptive functioning) and biological studies (e.g., linking valuation motive strength to specific genes or gene abnormalities) have the potential to lead to fruitful avenues of investigation.

Another promising line of research is a systematic examination of the interplay between the executive and reflexive components of the self-system and the conferred evolutionary benefits. Although we readily acknowledge the hypersociality of the *Homo* species, we also believe that what crucially separated humans from other animals is not necessarily relational or group life per se. Rather, it is the executive and reflexive capacity to approach and avoid relationships or groups. By using this reflexive capacity in this way, an individual is capable both of harvesting the benefits of relational and group life (e.g., protection from predators, food sharing, help in habitat construction) and escaping its costs (e.g., a sudden drop in the group competitive power, reduction in group size due to unfavorable antagonistic encounters, presence of parasites in the group as discussed in Kurzban & Leary, 2001).

We welcome the conduct of such research and look forward to its results. The ideas of natural selection and evolution are powerful, and as such they can be applied in ways that are very appealing, even in the absence of data. Consequently, it is all too easy to spin alternate tales of the action of evolution in the development of the human species, and often these contradictory tales can sound equally convincing. It is because of this that empirical data testing competing evolutionary hypotheses are urgently required. Indeed, it is the empirical exploration of the ideas about the design and functions of the human capability for self that we regard as a high-priority agenda item for social psychological research.

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Footnotes

[1] We should note that there some controversy as to whether Broca's area is specifically a language area (Kan & Thompson-Schill, 2004).

[2] For the purposes of this discussion, we will use the umbrella term "human symbolic self" to refer to all three capacities, namely, representational, executive, and reflexive.

[3] Some authors point to the importance of the location of the root of the tongue and the position of the hyoid bone in the speech production system (Nishimura, Mikami, Suzuki, & Matsuzawa, 2003).

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