cues that may serve to signal word boundaries vary from language to language. Nevertheless, and despite these challenges, normally developing infants begin to succeed at recognizing words in fluent speech as early as 7.5 months of age (Jusczyk & Aslin 1995). This has been attributed, in large part, to caretakers' tendency to repeat content words when addressing their infants. In fact, repetition of the full form of a word is perfectly reasonable – even expected – in speech directed to infants, and this repetition is quite distinct from the reduction to pronominal form that occurs across mentions of content words in adult-directed speech. Although repetition is often listed as one of many characteristics of speech directed to infants, it is generally viewed as subordinate to the prosodic quality of such speech. So although repetition appears to be an important feature in guiding speech segmentation, it is not the aspect of motherese that is most often referred to as influential in language learning. However, as Falk points out, naming is a fundamental aspect of theories on the origin of symbolic categorizing, and so should play an important role in theories of language acquisition.

In other work, my colleagues and I have observed that infants' early recognition of highly familiar words (e.g., their own names) serves to anchor them in the speech stream for subsequent parsing. Our data indicate that not only will 6-month-old infants listen longer to a word previously paired with their own name in fluent speech relative to a word paired with another name, but they do not listen reliably longer to the word that followed another name relative to a nonfamiliarized control word. These findings hold even when infants' first names are replaced in fluent speech with the words "mommy" or "mama" (depending on how an infant's caretaker refers to herself when addressing her infant). This is the youngest age at which speech segmentation has been shown to take place, indicating that infants' recognition of their own names and the names of important others is a basic tool that they can use to break into the speech stream early on.

Both sets of findings reported here are consistent with Falk's analysis. Her observations are an important step toward refocusing the debate about the origins of motherese from one about how infants learn language (in all its complexity) to one about how language itself evolved. Although the relevance of one set of questions to the other should be apparent, there has been a general unwillingness on the part of those who study language acquisition to address the language evolution side of the debate. In avoiding that question, we have missed the most logical link between motherese and language learning. Rather than viewing motherese as a bias on the part of caretakers that has led infants to acquire language, motherese may instead be considered the egg that begat the chicken itself. That is to say, without motherese there would perhaps be no language at all. With this analysis, arguments about the underpinnings of language acquisition come full circle (e.g., back to claims about the origins of language). Falk has mapped out an elegant way of thinking about this problem. One can only hope that it will influence how researchers think about the influence of motherese on language learning.

How plausible is the *motherese* hypothesis?

Paul Bouissac

French Linguistics, University of Toronto-Victoria College, Toronto, Ontario M5S 1K7, Canada. **paul.bouissac@utoronto.ca**
http://www.semioticon.com/Bouissac/Home.htm

Abstract: Falk's hypothesis is attractive and seems to be supported by data from primatology and language acquisition literature. However, this etiological narrative presents a fairly low degree of plausibility, the result of two epistemological fallacies: an implicit reliance on a unilinear model of causality and the explicit belief that ontogeny is homologous to phylogeny. Although this attempt to retrace the early emergence of prelinguistic capacities in hominins falls short of producing a compelling argument, it does call attention to an aspect of linguistic behavior which may indeed have evolved under the pressure of nurturing constraints.

Dean Falk notes in her conclusion that only the invention of the time machine could bring to a close the academic controversies concerning the origin of language. That may be true, but in the meantime we have no choice but to debate the plausibility of various narratives and to construct arguments based on indirect data. The reasoning may appear more or less compelling and the data more or less relevant. It ensues that theories of the origin of language differ by their degree of plausibility within the confines of commonsense logic or "bounded rationality" (Gigerenzer & Selten 2001). The linguists who promote the genetic mutation hypothesis develop an argument by default: It is not because there is yet any direct evidence that this is the case but, rather, because they cannot explain otherwise the apparent ease with which children universally master language in spite of the assumed incompleteness of the input. Those who prefer the gradualist approach, following Darwin's view that evolution proceeds through small changes selected by the environment, look for the steps that may have led to human language either as an emergent phenomenon or as a cumulative process. Dean Falk proposes a narrative of the latter kind. The question is not whether she is right or wrong – because by her own admission there cannot be any definite answer – but what is the degree of plausibility of her *motherese* hypothesis.

Falk's argument is attractive because it locates the origin of language in the mother-child dyad, which is the locus of language transmission among modern humans, but its degree of plausibility is not very high due to questionable epistemological assumptions. First, the argument follows a unilinear model of causality. Looking for a single cause as the source of an event that has consequences for our survival is certainly statistically adaptive. *Homo* has evolved cognitive strategies to locate quickly the origin of disruptions in its environment as the best way to control a potential danger. If the cause is correctly identified, predicting what comes next is usually easier. Wasting time scanning too much information in order to get a complex picture of various factors can be fatal in real life conditions. Scientific inquiry is likewise driven by the urge to identify causes; however, assuming a single cause for each phenomenon is an epistemological fallacy. There are other candidates, in the same order of possible origins of articulate language, such as primate vocalizations with meaningful acoustic variants (Owren et al. 1997; Rendall et al. 1999; Zimmerman et al. 1995) or intensive vocal interactions aimed at courting, pair bonding (Deacon 1997, pp. 385–410), expressing commitments (Silk 2002), and social grooming (Dunbar 1997), which are not mutually exclusive and are equally plausible as adaptive vocal behaviors leading to protolanguage, and which could even be construed as prerequisites for motherese, rather than the reverse as Falk claims. Her argument arbitrarily isolates the mother-child dyad and locates it artificially in relatively safe surroundings. To many, in agreement with Falk, a gradualist hypothesis appears more plausible, if only because the social nature of language makes it unlikely that a single mutation of this importance in a single individual could have been selected. Since simultaneous identical mutations are highly improbable, the proponents of a sudden emergence now tend to favor exaptation as their explanatory principle (Pinker 1994).

This, of course, is not incompatible with Falk's argument, but neither does it mean that a single cause can account for the evolution of language. Moreover, the single point of origin considered by Falk, in spite of its multimodal framework, fails to explain how the most specific properties of human languages such as referentiality and syntax could have developed from these early phatic vocalizations. Invoking bootstrapping to explain the move from phatic to referential communication begs the question if it is not explicitly shown how it may have proceeded, and under which evolutionary constraints. Finally, the use of the term "motherese" is particularly misleading in this context because, in contemporary pragmatics, it applies to the mother's or other adult's ID verbal productions which tend to distort and simplify already fully constituted languages. If motherese presupposes the possession of a

https://doi.org/10.1017/S0140525X04250117 Published online by Cambridge University Press

language, does not Falk's logical argument collapse? Or, should she have used *protomotherese* and then explained under which constraints motherese evolved from protomotherese? The root of this aporia may be the second fallacy that permeates this article.

From the kind of indirect evidence the author marshals in support of her hypothesis, she is clearly implying that the observation of developmental behaviors, in both primates and humans, provides reliable information regarding the evolution of these behaviors. The assumption made by Haeckel in 1866 that ontogeny "recapitulates" phylogeny seems to be the reason Falk devotes a good half of her paper to reviewing the abundant literature pertaining to early language learning and to apes' maternal behavior. Although the latter may have changed over time in response to environmental conditions and may even be susceptible to cultural variations (Van Schaik et al. 2003), the former cannot yield any clues regarding the origin of language. To think that the ontogenic development of language learning can be a window on the evolution of language as such is not a tenable option. The idea that ontogeny (the growth of an embryo) recapitulates phylogeny (the evolutionary history of a species) has long been discredited. Yet Haeckel's notorious biogenetic law still provides a powerful metaphoric model to which Falk bears witness in her conclusion: "Motherese . . . is the *only* available model for elucidating how humans universally acquire spoken languages today, and therefore may have acquired them in the past" (sect. 4, para. 1, emphasis Falk's). This statement is either trivial (all children learn their native languages along the same developmental steps now as they did in the past) or a play on words ("acquire" does not have the same meaning in the premise as in the conclusion). This is not a robust argument.

Would only going back in time, as Falk rhetorically suggests in her final paragraph, enable us to discover the "true" origin of language and settle the debate? This is unlikely. We are contemporary of many evolutionary processes that we experience and observe without understanding them in spite of investing considerable resources to solve the problem of their true nature. The conundrum of language origins is only one aspect of our ignorance of the very ontology of language. This does not mean that we should not keep trying to formulate hypotheses, notably regarding interdependent, multilinear evolutionary factors.

Bipedalism, canine tooth reduction, and obligatory tool use

C. Loring Brace

Museum of Anthropology, University of Michigan, Ann Arbor, MI 48109.
clbrace@umich.edu

Abstract: Bipedalism in the earliest hominid specimens is always accompanied by the reduction of projecting canine teeth. Body size is smaller than chimpanzees or humans, but molar teeth are markedly larger. Use of a pointed stick for defensive purposes on the one hand, and digging for USOs on the other, may be why bipedalism was selected for. Passing such learned behavior to the next generation may have played a role in selecting for language.

There is another aspect of the circumstances associated with the adoption of a bipedal mode of locomotion that may well have contributed to the development of the linguistic realm. Hominid bipedalism is slow, and our early bipedal relatives were relatively small of size (Hartwig-Scherer 1993). The survival of small, slow-footed hominids on the African savannas or the adjacent open woodlands would only have been possible if they had possessed a means of defense which transcended that of the other primates that are found in similar kinds of habitats. Baboons defend themselves with truly formidable canine teeth, but the early hominids had canine teeth that did not project beyond the occlusal surface of the rest of the teeth in the dental arch.

The late Sherwood Washburn made the observation that if the baboon were to employ a digging stick to assist in foraging, it could nearly double its food-getting efficiency (Washburn 1959; 1960). This may very well have been the key that allowed the early hominids to compete successfully with baboons and warthogs for survival in the African savannas during the Pliocene. It has been noted that "the digging stick redirected is a more effective defensive weapon than even the formidable canine teeth of the average male baboon" (Brace 1995). The need for carrying such a dual-purpose tool may well have been the selective force that led to the development of habitual bipedalism, as it is awkward at best for a quadruped to move effectively from one place to another when one forelimb is carrying an item essential for survival and is therefore unable to play a role in support.

It has recently been said that "Canines don't just fade away, they must have been actively reduced by natural selection," yet no scenario for their reduction by selection has been suggested (Deacon 1997). However, the case has been made that traits *will* "just fade away" if they are not maintained by selection. Darwin offered a series of examples in the *Origin of Species* (1859, pp. 134–49, 454). Forty years ago, I labeled the process the "probable mutation effect" (Brace 1963; 2000, Ch. 5). This is fully compatible with "neutral theory" in molecular biology (Brace, in press; Kimura & Ohta 1969).

The australopithecine life history pattern as shown by tooth root formation is more like that of a chimpanzee than that of a modern human being (Smith 1992). Newborns, then, may well have had the aspects of greater maturity characteristic of chimpanzee neonates, and also may well have been able to cling to the maternal fur. It has been said that "it is not inconceivable that the first step across the symbolic threshold was made by an australopithecine with roughly the cognitive capabilities of a modern chimpanzee" (Deacon 1997, p. 340), and with a tiny "vocabulary" of 5 or 10 words and only two or three types of combinatory rules like toddlers' syntax (p. 41). Those beginnings may very well have been analogous to what is being called "motherese." From that point on, the adaptive value of symbolic expression can very easily be seen as the selective force that led to the increase in brain size. The coevolution of language and brain size follows from there to the point where language as we know it characterizes all human groups (Deacon 1997, Part 3).

Oldowan tool-making australopithecines were evidently scavenging in the Late Pliocene in Africa about 2.5 million years ago (Hay 1976; Shipman 1986). By the Early Pleistocene, just under 1.9 million years ago, the Oldowan toolmakers were practicing what has been called "persistence hunting" (Bortz 1985). Two major changes in the australopithecine body made this possible, one clearly documented and the other surmised on reasonable grounds. The first was the achievement of the body proportions of recent members of the genus *Homo.* Early Pleistocene body proportions are remarkably similar to those of living humans (Ruff & Walker 1993). The other change, which we can infer but cannot prove, is the loss of the normal mammalian fur coat, presenting a bare and sweat-gland-endowed skin to the atmosphere. If, as we guess, our early hunters were engaging in persistence hunting, then there should have been strong selection for developing the means of dissipating metabolically generated heat. We know that humans today have more capacity for sweating than any other mammal (Macfarlane 1976, p. 185), and Falk herself has shown that a mechanism for cooling the contents of the cranium was clearly evolving between the time of the late australopithecines and that of the early members of the genus *Homo* (Falk 1990).

The emergence of that toolmaking and hunting member of our own genus also saw a major increase in brain size, putting it about halfway between that of the chimpanzee and the human ranges (Begun & Walker 1993; Vekua et al. 2002). Rate of maturation was also about halfway between the ape and the human condition (Smith 1993). *Homo* was now living the life of a facultative carnivore that had spread out of Africa and across the warmer portions of the entire Old World. As with that other highly mobile member

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