

CONFERENCE REPORT

THE EVOLUTION OF LANGUAGE:  
ASSESSING THE EVIDENCE  
FROM NONHUMAN PRIMATES

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1. INTRODUCTION

Some light is emerging from the recent explosion of interest in language origins. An advanced seminar held at the School of American Research, Santa Fe, NM, USA, October 13–17, 1996, may illuminate more than most previous contributions. Organized by Barbara J. King, the seminar was titled “The evolution of language: Assessing the evidence from nonhuman primates.” Participants at the seminar were:

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The theme of this seminar exemplifies the philosophy of the School of American Research to study human culture, “its beginnings, development, variety [and] dynamics,” particularly through its support for “research development, stimulation, and completion” (Elliot 1991). The papers discussed at the seminar are being edited by King for submission to the Advanced Seminar Series of the SAR Press. This article highlights some of the points to emerge from the seminar that will be fully elaborated in the book.

The major conclusions of the seminar were that continuity between human and nonhuman primate communication could not be ignored; that in assessing how animals communicate it is as important to consider what they can comprehend as what they can utter; that the role of specific patterns of ontogenetic development in both humans and nonhuman primates is important; and, that the pattern of ontogenetic development has itself changed during the course of hominid and human evolution.

2. CONTINUITY BETWEEN HUMAN AND NONHUMAN PRIMATE COMMUNICATION

In her previous work, King (1994), a biological anthropologist, identified a significant problem in the study of nonhuman primates: how do infants and other inexperienced animals acquire information essential for their survival? Her data on free-ranging baboons, taken together with a review of the literature in primatology, suggested that two processes are at work. One, information donation, in which adults intervene in infants' behavior or guide that behavior, occurs rarely, most often among great apes. The other, information acquisition, in which infants direct energy toward extracting information from adults in various ways, is widespread among primates. In reaching this conclusion, King recognized that there are significant similarities in the process of information acquisition among nonhuman primates and humans, such that it is preferable to consider the continuities as well as the discontinuities between nonhuman primates and humans.

This issue has been a consistent feature of historical debates about the origins of language, particularly as discontinuity presents a problem for the incorporation of language into evolutionary argument (Taylor 1997). This theoretical perspective informed King's choice of participants at the seminar and was evident in the precirculated papers. All participants seemed to be committed to a view of the emergence of language as an evolutionary process, susceptible to investigation through empirical evidence from modern animals and human ancestors. This evolutionary view stands in opposition to the quasi-creationist, anti-evolutionary view of Chomsky and attempts by such as Pinker (1994) to rescue Chomsky's view of language from such labelling. For Chomsky and Pinker, language is so different from other communication systems in nature that it represents a complete discontinuity between humans and other animals.

King appealed for theorists to stop talking past each other, an outcome that she feels will be hastened when currently unacknowledged differences in definition, assumption, and use of evidence from both primatology and linguistics are brought into the open. To this end, she reviewed several recent

language-origins theories that, in her paper, she characterized as representing either the continuity/evolutionary or the discontinuity/essentialist view. She asked how each theorist uses the primatological evidence and how each views language, and was most concerned with asking why, within each category, the evidence is interpreted a particular way. Examples showed how continuity theorists need to minimize the gaps across species, for example, in order to argue for a continuum in language abilities, whereas discontinuity theorists need to see special features of human language in order to argue for human uniqueness.

As a result of the seminar discussion, King decided that the terms *continuity* and *discontinuity* were too rigid, and serve to retard interdisciplinary dialogue because they give the impression that there are only two types of theories. In fact, King came to see during the seminar that the variation in language-origins theories is more complex, with most theories integrating elements of both continuity and discontinuity, but differing in what specific questions they are willing to ask about nonhuman primate behavior, human language, and language origins. She will analyze these differences in her book chapter as a first step in breaking the cycle of claim and counterclaim that characterizes the current language-origins literature.

Dario Maestriperi, an ethologist and primatologist, emphasized that comparative studies of primate communication can provide important information concerning the evolution of human communication and language. The evolution of language was made possible by an increase in brain size and important modification of the vocal apparatus but these changes do not explain why language evolved. The comparative study of communication systems across primate species living in different ecological and social environments can elucidate why some species have greater repertoires of signals and more complex communicative interactions than others and, in turn, provide insight into the selective advantage of language evolution in the hominid line. Maestriperi pointed out that very few comparative studies of primate communication have yet been done. It was emphasized in the discussion that even recent studies of vocalizations such as those by Cheney & Seyfarth (1990) and

Mitani (1996) have, almost of necessity, concentrated on a limited range of utterances that are relatively easy to observe at a distance in the field. Moreover, there was a noticeable tendency to move away from emphasis on the vervets' well-known alarm calls towards the work on the grunts and *wrrs* that are commonly part of their close-range interaction. Equivalent studies of apes are not yet available.

Maestriperi showed that there were significant differences in the size of the gestural repertoire and in the communication dynamics of rhesus, pigtail, and stumptail macaques. These differences appear to be consistent with the characteristics of their social organization: little affiliative communication among the despotic and nepotistic rhesus monkeys; intense affiliative communication among the pigtails, which have complex dynamics of cooperation within the group, and considerable social tolerance; a great number of dominance and submission signals in stumptail macaques that appear to have evolved in response to the aggressive potential of this species. Maestriperi suggested that a reduced influence of dominance and kinship on the social interactions of hominids or early humans, along with an increase in group size, may have facilitated the evolution of more complex forms of communication. He also pointed out that there appears to be a trend for increasing complexity of gestural communication in the Primate order and that primate gestures may have played a more important role in the evolution of language than previously thought.

In her discussion of Maestriperi's paper, Savage-Rumbaugh pointed out the need to go beyond giving a name to communicative utterances, their contexts and responses. She pointed out that in looking at human communication we do not identify utterances as "given in a situation of tension," but rather interpret the communication. Rich interpretation of nonhuman utterances in this way is very difficult, as exemplified by the difficulty of finding a simple translation of the vervet "alarm" calls (whether, indeed, they are "alarms" at all). Rich interpretation is always identified as anthropomorphism—too often regarded as unacceptable in scientific observation (Kennedy 1992).

Charles Snowdon, a psychologist and biologist, was one of four people (together with Davidson, Gibson and Savage-Rumbaugh) who had taken part in a previous conference on similar themes (Gibson & Ingold 1993), organized on that occasion by the Wenner-Gren Foundation. Snowdon brought to this seminar his experience in communication among New World primates, particularly marmosets and tamarins (Snowdon 1990). New World primates are particularly interesting in this discussion because of their long isolation from the primates more closely related to humans. Similarity between New World primate communication and features of language would imply either a very ancient common ancestry, or a very strong degree of convergent evolution. Moreover, the small size of both marmosets and tamarins makes it relatively easy to manipulate experimentally some of the contexts of interaction among individuals in different populations.

Snowdon's presentation to this seminar took an empiricist's view of language evolution and development, beginning with the framework for understanding the features of language defined by Hockett (1960; Hockett & Ascher 1964); these include semanticity, arbitrariness, displacement, and productivity. While this framework does provide insights into the distinctiveness of language (Boehm 1992; Noble & Davidson 1996), it is less clear that there is any one of these features that is a characteristic of language alone. As a result, it is difficult to pin down the special or unique features of language that distinguish it from other forms of communication.

Snowdon emphasized that many of the data that appear to support arguments about innateness of language can be accounted for by processes of learning and motivation. This is particularly the case as these processes occur in an environment where other animals make consistent sets of communicative utterance in company of infant animals with perceptual systems tuned to such utterances. This was one of the most often repeated themes of the seminar, with the obvious inference that talking around and to one's children from a very early age will have a critical influence on their language skills later in life. Snowdon documented this claim from his observations of marmosets and tamarins, showing how call patterning of the

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monkeys changed when they were introduced to another group of individuals which they had never heard before (Elowson & Snowdon 1994). Such vocal flexibility turns out to be widespread in animals, being found among birds, kangaroo rats, dolphins, dwarf mouse lemurs, marmosets and humans. Given the phylogenetic diversity among these animals, it seems plausible that the most significant limit on the number of species in this list is the number of species that have been appropriately observed.

Similarly, a wide range of parallels exists for infant babbling, a stage of production of vocal utterance that usually precedes the production of utterances meaningful to adults. Pola and Snowdon (1975) first described babbling in pygmy marmosets and more recently Elowson, Lazaro-Perea and Snowdon (in preparation) have demonstrated seven major features of infant pygmy marmoset babbling that have parallels in the babbling of human infants.

Robbins Burling, an anthropological linguist, had previously published an analysis of human communicative utterances (Burling 1993), emphasizing the importance of what he calls gesture-calls (gasps, grunts, giggles, and laughs, for example), often grouped together as nonverbal communication. In that argument, he emphasized that human language seems unlikely to have emerged out of the gesture-calls common among nonhuman primates, such as the so-called alarm calls of vervet monkeys (Cheney & Seyfarth 1990). At this seminar, Burling extended his analysis to a wide range of what he called "motivated signs" in human communication, to distinguish them from the typical signs of language which are arbitrary. Snowdon had been at pains to emphasize that distinctive features of human language development can be found in parallel emergence of communication in nonhuman primates. Burling's contribution was to show the wide variety of features in human speech, such as gesticulation or intonation, which are at once essential to communication, but express through resemblance between utterance and meaning the attitude or emotions of the speaker rather than the meanings of the words.

Burling's distinction between gesture-calls and motivated signs underlies his belief that language could not have emerged

from a communication system similar to the gesture-calls of nonhuman primates. He likened the distinction to one between an analogue system of graded signals in primate calls (Marler 1976) and the digital signals of language. These digital signals are capable of being combined into an infinite set of patterns by following syntactic rules. Burling emphasized that many (but not all) of the principles of syntax are themselves iconic. Syntax did not get much attention during the seminar, which is probably appropriate if it is origins of language that are being discussed rather than evolution of languages.

Motivated signs, therefore, pervade spoken and signed languages, but some of the motivation has now become highly conventionalized, tending to make the commonly used signs seem more arbitrary. It would be possible to speculate about the initial stages of emergence of communication which uses arbitrary signs, provided there were some evidence for motivated signs among nonhuman primates. This is beginning to emerge from experience of ape-language research, where it is arguable that there is crucial influence from humans using both motivated and arbitrary signs. The use of iconic signs by gorillas at San Francisco Zoo to solicit sexual activity (Tanner & Byrne 1996) presumably represents a usage that was not influenced by the pervading presence of humans at the zoo.

### 3. COMPREHENSION AND PRODUCTION IN COMMUNICATION

There was general agreement at the seminar that in the past too much emphasis has been placed on the production of language, and too little on its comprehension and usage. Recognition of this was part of the fundamental breakthrough in ape-language research achieved by Sue Savage-Rumbaugh and her colleagues at the Language Research Centre (Savage-Rumbaugh 1986; Savage-Rumbaugh, Murphy, Sevcik, Brakke, Williams, & Rumbaugh 1993), first with the chimpanzees Sherman and Austin and more recently with the bonobos Kanzi and Panbanisha. The ingenious and meticulously documented research with these animals demonstrates beyond doubt that, in appropriate circumstances, great apes have learned to use a system of

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computer-keyboard symbols (lexigrams) to communicate with each other and with the human devisers of the experiments. Among the key insights of this research has been that the bonobo Kanzi learned communicative comprehension and production without training by being brought up from a very young age in the laboratory where his foster mother was being trained (unsuccessfully) to learn such communication (Savage-Rumbaugh & Lewin 1994).

Much of the appeal of Savage-Rumbaugh's work has been the rigor of its experimental design. The history of reaction to ape language research has shown wide swings between skepticism (Terrace 1979) and wonder (Patterson & Linden 1982) at the revealed abilities of apes. Savage-Rumbaugh has been able to demonstrate that in the appropriate circumstances it is really possible to talk to the animals (Savage-Rumbaugh 1986; Savage-Rumbaugh, et al. 1993; Savage-Rumbaugh & Lewin 1994; Savage-Rumbaugh, McDonald, Sevcik, & Hopkins 1986), and to provide the circumstances for them to talk to us. It is the rigor of this experimental work that enables us to accept claims that might otherwise appear outlandish. Experience of working with apes shows that there are many more incidents that are not controlled with the same rigor that seem to demand explanation in terms of levels of language comprehension by apes that are even more remarkable (Savage-Rumbaugh and Lewin 1994). Savage-Rumbaugh argued that, even in the absence of experimental rigor, many incidents should be interpreted generously to indicate levels of comprehension and human-like communication ability among apes such as have been previously unimagined.

Crucial to our understanding of the significance of ape language research is the issue of the context of learning, and what that implies. Kanzi appeared to learn his remarkable communication skills "because" he was not taught—in much the same way that a child learns language—and repetition of the circumstances has produced similar results in some other bonobos and chimpanzees. Some take that to imply that "language", or some crucial aspect of it, is innate, and thus that if Kanzi has learned crucial aspects of it, this reveals an innate capacity for language in apes. The test of this hypothesis, therefore, must be

sought in the wild to see what abilities apes reveal without the stimulus of laboratory upbringing and cross-species learning. Savage-Rumbaugh showed videotape of wild (but provisioned) bonobos at Wamba in Zaire, where they appear to produce modifications of vegetation that index changes of direction of movement through the forest (Savage-Rumbaugh, Williams, Furuichi, & Kano 1996). In addition they appear to use a(n) (iconic) gesture to solicit sexual activity, though, given the famed frequency of bonobo sexual activity, it might require many repeated observations to determine the “meaning” of such a gesture with appropriate rigor. Moreover, as a test of the importance of learning context, it will be necessary to try to observe how, from one generation to the next, bonobos learn to communicate changes of direction or ways to solicit sexual activity.

Others (e.g. Noble & Davidson 1996) argue that ontogenetic circumstances have changed during the course of human evolution, and that these changes have been crucial in the evolutionary emergence of learning, teaching and, ultimately, the emergence of communication using symbols, i.e. language. The real significance of Kanzi’s learned abilities may be in the ontogenetic circumstance of their acquisition, not the innateness of the capacities revealed, an important point for continuity theories.

#### 4. ONTOGENY OF LANGUAGE ACQUISITION

What, then, are the circumstances of the ontogeny of human language acquisition? At least two processes seem to be involved: first, development of behavior, seen most obviously in the production of utterances by infants, but, in reality, involving a changing relationship between infants and caregivers as well as massive changes in comprehension by infants; and, second, development of brain and anatomy. Because these developmental processes proceed together, it is sometimes easy to suppose that the changes in the behavior of the infant are as inevitable as the anatomical changes. The work with Kanzi seems to show that radical alteration of the social environment can

produce radical effects on behavioral development. Many animals may have sufficient behavioral plasticity to respond to changed developmental environments in this sort of way. Almost all humans are brought up in an environment that includes other humans who are language-users, and through this developmental process they acquire language. It seems likely that, in the absence of language-using adults, infants would not acquire the use of language.

Lorraine McCune, a developmental psychologist, proposed the well-studied field of language acquisition as offering a “human model” for understanding communicative development in both extant and ancestral primate species. In the context of close affective bonds with primary caregivers, human infants develop the capacity for symbolic representation, refine their vocal motor skills, come to recognize the relation between sounds and meanings, and proceed to language comprehension and production.

McCune’s most controversial proposal was that sound-meaning correspondence has its basis in physiological and vocal processes common to humans and other mammals. Species as diverse as rats, humans and gorillas exhibit communicative function for a laryngeal vocalization termed a “grunt”. This sound has its origin as the autonomic accompaniment of metabolic demand (e.g., effort, thermoregulation). In humans, grunts also accompany the effort of focal attention. According to McCune, it is the co-occurrence of a consistent vocalization with a consistent mental state that generates sound-meaning correspondence and prompts the shift to “communicative” grunts in humans, and potentially in other primate species. This sequence demonstrates the Darwinian postulate that social signals may originate in processes that serve a basic physiological function for the animal. McCune (McCune, et al. 1996) reported a shift to referential language and an increase in lexical production in human infants following communicative grunt use. McCune presented supporting comparative data from vervet monkeys and chimpanzees, demonstrating a similar sequence of functions for grunt vocalizations to that found in humans, with differences in cognitive capacity and available ambient communicative systems accounting for observed di-

ferences in resulting communicative repertoire. She cited research demonstrating greater cognitive capacity in apes than in monkeys. Apes exposed to human symbol systems demonstrate that some species' capacity for symbolic communication is beyond that documented to date in field observations.

Kathleen Gibson, a biological anthropologist, presented evidence relating to some of the key areas of discussion of anatomical associations of language. The standard story here has been Lieberman's and Laitman's argument that important anatomical changes which facilitated the evolutionary emergence of speech occurred in the throat (e.g., Lieberman, Laitman, Reidenberg, & Gannon 1992) and can be identified by examining the shape of the base of the skull. Gibson has shown that Lieberman and Laitman are wrong about the structure of the throat and its relation to the shape of the base of the skull. Noble and Davidson (1996) point out that, in any case, Lieberman's arguments relate to the production of vocal utterances. Language and speech are obviously very closely related in all unimpaired humans, but, given the range of ways in which language is now expressed (including the signed languages of the Deaf), it could have emerged without speech. In addition, the emergence of an anatomy necessary for speech does not necessarily imply that vocal utterances thus made possible were used for language.

Gibson also discussed the differences in absolute and relative brain sizes among primates, and the different proportions of primate brains identified as different structures. For example, she emphasized that regions now associated with procedural learning (basal ganglia and cerebellum) are larger in humans than in great apes. Gibson argued that the evolution of language involved the coordinated evolution of many regions of the brain, with hierarchization of the component parts, in the context of the evolution of diverse behavioral capacities. She then discussed the archaeological evidence for that behavioral evolution. Just how important the archaeological evidence can become in this debate is exemplified by the fact that Gibson and Davidson each produced different interpretations of the same evidence. There is room for some careful attention to the methods by which the evidence is interpreted.

5. THE EVOLUTION OF ONTOGENY

Iain Davidson, an archaeologist, also considered the evolution of the brain—as an example of the difficulty of deciding whether any evolutionary process is best discussed in terms of continuity or discontinuity.

Language, he suggested, creates discontinuities by giving names to things (including parts of continuous processes) so that they can be discussed. In the telling words used by Burling, this gives words a digital quality distinct from the analog nature of most other types of animal communication. The challenge is to see how the emergence of the discontinuity that is language can be seen as part of a continuous process. Davidson suggested: (1) that this challenge can only be met by clear identification of how the evidence from nonhuman primates is to be used in the argument, and (2) that the appropriate methods depend on the timescale at which the evolutionary questions are to be answered. His approach to this is to identify the characteristics of the last common ancestor of humans and the other African apes and model the interrelated changes that have occurred since (Noble & Davidson 1996).

For Davidson (and Noble), therefore, the evolutionary emergence of the distinctive human relative and absolute brain size must be seen in the context of the emergence among hominids of bipedal walking and other skeletal changes implicated in the relation between gestation and brain growth. Crucial to what people do with their brains (including language) is the long period of infant dependence, involving infant carrying and opportunities for joint attention between adult and infant during a period of brain growth, that is unusual by comparison with any other animal including other primates. The opportunities for learning during this period are unique because of the amount of time involved, the context of increased joint attention with adults and the amount of brain growth. It is during this period of a child's life that the "guided reinvention of language" (Lock 1980) takes place—a reinvention in which adult language users are essential. The original invention of language could not have involved infants learning it from adults who did not use it!

The issue that remains, therefore, is how the original invention occurred, how (*pace* Burling) a primate communication system was transformed into language. Clearly the processes that are involved include the appearance of motivated signs, the separation of communications from motivational states, the emergence of distinctive patterns of social interaction as well as anatomical changes (such as increased absolute and relative brain size).

Just how complex the process was can be understood by remembering that not all language is delivered as speech or the written text that derives from it. Sherman Wilcox, a linguist, presented to the seminar an argument from the world of signed language of the Deaf that manual and vocal communication evolved together, something greatly assisted by the increased amounts of joint attention that emerged among hominid adults and infants. Wilcox argued that bodily movements involved in doing things (instrumental acts), through their repetitive association with the act (ritualization), become indexical of the act, and hence may become a sign for that act “emancipated” from the act itself. If procedural learning is involved here, the relative expansion of the cerebellum, identified by Gibson, is part of the selective context for such repetitive acts to be communicative. Once emancipated, such indexical signs are transformed into symbols, displaced from their referents, arbitrary (since they are not the whole act) and conventional (because of the ritualization process), now routinized not ritualized. Recent research has shown the existence of iconic gestures among captive gorillas (Tanner & Byrne 1996), and perhaps among the Wamba bonobos. It may be that such gestures among apes are the kinds of rare behaviors on which natural selection could operate to produce language from a non-symbolic communication system.

In this argument, Wilcox comes close to a scenario postulated by Noble and Davidson (Davidson & Noble 1989; Noble & Davidson 1996) whereby gestural communication may become an object of attention, outside the context in which the communication was intended, through accidental or incidental recording of the outline of an iconic gesture as a trace in some more permanent medium. Some such step is essential for the

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ritualized gesture to become decontextualized so that it can refer to the stimulus for the gesture outside the presence of the stimulus—the displacement characteristic of language. Once words are themselves the objects of attention—symbols of what they refer to—new possibilities open up.

In Wilcox's argument, there are two further steps of importance beyond the emancipation of the gesture. First, gestures "carry the seed of syntax" since they are both name and relation (Armstrong, Stokoe, & Wilcox 1995). The physical linkage of gestures in strings of utterances is itself iconic of the relations between the utterances. Hence, there is a strong iconicity in the elements of syntax. An important involvement of bodily gestures in the early emergence of language would go a long way to demystifying the importance of syntax in defining whether a communication system is language-like. Second, there was a shift of emphasis from the visual to the vocal channel, though we cannot suppose that human ancestors were silent while gesturing, nor should we fool ourselves that modern people do not gesture meaningfully as they speak (see Kendon 1993). Wilcox's scenario for the shift in emphasis involves the same process as that by which indexical signs emerged through ritualization (repetitive association) from acts. Vocal utterance came to have the same indexical quality through repetitive association with the indexical gesture, but once vocal and visible gestures could symbolize the same things, there would be selection for the vocal/audible channel in contexts where the hands were not free, or where it is difficult for one partner in the communication to attract the attention of another.

The issue that Wilcox, and Davidson and Noble, have been trying to grapple with is how the dual communication system emerged among humans while remaining single among non-human primates. Monkeys may be able to behave as if relations with kin were important, but they do not have any means of commenting on that (Cheney & Seyfarth 1990). Somehow language developed the ability to name such relations. Somehow a communication system emerged in which people could refer to the nature of the communication itself, and we call this language. Somehow language emerged by which people could ask how language emerged. The consensus of the seminar was that

such questions could not be answered without understanding the whole natural context of information transfer among human and nonhuman primates.

In a final presentation to the seminar Talbot Taylor argued that perceptions of “the problem of the evolution of language” are clouded by our failing to take into account the reflexive characteristics of language—our ability to use language to talk about language. Language is what it is for us because it is an object of our reflexive attention. It is a feature of contemporary language use (at least), that we rely on this inherent reflexivity: i.e. on the metadiscursive practices by which we may do such things as comment on, question, object to, correct, describe, explain, justify, complain about, and (in countless other ways) characterize others’ and our own language acts. Seen from a relativist (or loosely Whorfian) perspective, “what language is for us” is to a large part constructed by our (highly literate) culture’s everyday metadiscursive practices of talking about language *as such*, and so conceptualizing it in those terms. Language-as-we-know-it consists in such things as words, sentences, and their particular meanings, as well as questions, answers, apologies, insults, promises, explanations, paraphrases, etc. And language-as-we-know-it is “divided up” into such things as languages, accents, and dialects. Our reflexive practices give us a taken-for-granted, culturally dependent, conceptual grid through which we understand what language is, what it consists of, what we do with it, and how it “works.” As a result, before we even begin studying language, let alone its evolution, we “know” *from the inside* that human language is a remarkably complex socio-psychological phenomenon and we “know” a great deal about its parts and how they work. But, then, when we turn to look at the communicative behavior of nonhuman primates from the “outside,” so to speak, we find little if any of this remarkable complexity that we “know” to be in human language. How then, we ask ourselves, can our language ever possibly have evolved from something as relatively impoverished as the communicative behavior of a wild bonobo? The gap between what we perceive in what they do and what we “know” we do seems to be far too broad for the gradual, incremental steps of natural selection ever to have bridged. On

arriving at such a conclusion many origins theorists have decided to opt for a metaphysical solution: i.e., to postulate that some “monster mutation” *must* have occurred in the evolution of human language (see Taylor 1997). And yet, Taylor reminds us, we need to recognize that the perceived gap is merely the illusion created by the very great differences between the culturally commonplace, reflexive techniques we employ in talking about—and so conceptualizing—our language behavior and the scientific techniques we rely on in characterizing the communicative behavior of nonhumans. Until we recognize the rhetorical nature and source of this illusion, the task of explaining how language evolved from *that* to *this* will continue to be like trying to explain how the manifold powers of the gods can possibly have evolved—by gradual, incremental steps—from the really rather pedestrian abilities of us mere mortals.

## 6. CONCLUSION

Thus the seminar moved from an emphasis on the continuities among humans and nonhuman primates in communication and information transfer towards a critical appreciation of the need to define what language is, in order to understand the process of its evolutionary emergence. Central themes on which we agreed were that:

1. among animals, communicative signs may or may not be motivated, but motivated signs are central to language use, even if some motivated signs are not part of the set of signs conventionally studied by linguists;
2. the distinctive features of language may derive in evolution from conventionalization and ritualization of iconic gestures;
3. the circumstances of communicative interaction between communicators are crucial to the nature of the communication and thus create selective pressures for its evolution;
4. ontogenetic development of infants is crucial to their abilities to communicate as adults;

5. the evolution of hominid and human skeletal form strongly suggests radical evolutionary changes in the ontogenetic development of infants, particularly through changes in the nature of interaction between infants and adults.

Ongoing research will enable us to move beyond assertions that there is something called language that is innate, or that language emerged through a process that is best studied through thought experiments, or that is impossible to investigate empirically, or that was driven by anatomical changes. At issue is a broader question of the source of the peculiar nature of human consciousness. Much empirical evidence and ingenious experiment has explored the psychology of nonhuman primates (Byrne 1995) and opinion is divided about the conclusions. Byrne himself concludes, from surveying the literature, that there remains a gulf between the nonhuman primate “mind” and the human mind. Emphasis on the ontogeny of human and nonhuman primate communication suggests that the gulf can be narrowed, as in Snowdon’s or Savage-Rumbaugh’s experiments, by changed ontogenetic circumstances. The question of whether “language emerged as a product of our evolving minds” (Burling 1993) may oversimplify the issue by reifying mind, rather than concentrating on the social basis of much of the behavior that we attribute to the minds of individuals. The integrative approach represented by this generation of language evolution theorists will broaden the scope of questions and theoretical linkages that move us toward understanding what it means and does not mean to be human.

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