Does language arise from a calculus of dominance?

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Abstract: Robin Dunbar's hypothesis that language capacity in response to the demands of maintaining large groups suggests a more specific hypothesis that language arose from a cognitive calculus by which animals could predict their status in complex dominance situations.

I was excited to read Dunbar's (1993) hypothesis that language capacity evolved in response to the demands of maintaining large groups. To relate the evolution of human language and brain size to social factors seems the right impulse. In the past, primatologists have often written as if very large brain-to-body weight ratios were rare because a large brain was itself difficult to evolve. The more reasonable assumption, however, is that very large brain-to-body weight ratios are rare because the circumstances that make them useful are very rare. So the question is: what evolutionary or cultural circumstances could have made large expanses of unassigned brain tissue so useful to early humans? The obvious answer is: some sort of language-like capacity. In other words, the evolution of the hardware (the large cortex) was driven by the development of a new software (language) that made that tissue useful. So then the next question is: what drove the development of the software?

Here Dunbar's general approach seems the most reasonable one. Language and cortical development was driven by the demands of an increasingly complex social organization. C. Ray Carpenter (1964/1942) argued in one of his classic primate papers that the analysis of a primate society begins with considering all the n(n-1)/2 interactions between the group members. The number of such interactions of course increases as a function of group size so that every additional group member adds n new pairwise relationships to the group.

This calculation, however, vastly underestimates the effects of increasing the size of a group because it assumes that the relationship between a pair of monkeys is uninfluenced by their relationships to other monkeys. We now know that primate societies are much more complex than that. Individuals must keep track not only of their relationships with each other member of the group but also with the effects of other group members on those relationships. Thus they must constantly engage in calculations such as, "When I am alone with Sam, I am dominant to him, but when Sam is with Joe, he is dominant to me except when I am with Harry, in which case . . . and so on." [See also Bernstein: "Dominance" *BBS* 4(3) 1981.]

In such complex societies, nature would select for any animal that developed a calculus of dominance. I have in mind not a generalized intelligence but a specialized cognitive module such as those hypothesized by Tooby & Cosmides (1992) and by Whiten (1993) in his commentary on the target article. Such a calculus would permit an animal to figure out whether he is dominant over another at any given moment without having to fight it out. For example, if I were a monkey, I might use such a calculus to figure out how the addition of a given animal, say Phil, to a social grouping that included myself, Sam, Joe, and Harry might affect my ability to take an apple away from Sam. The calculation might go something like:

Who gets the apple, Sam or I, when Phil is added to a group that includes Harry, Joe, Sam and me?

When Sam and I are alone, I am dominant to Sam.

But when Joe joins me and Sam, Sam is dominant to me.

When Harry joins me, Joe, and Sam, I am dominant to Sam.

Phil supports Joe.

Phil dominates Harry.

Therefore, when Phil joins a group consisting of me, Sam, Harry, and Joe, I had better not try to take an apple away from Sam.

Such a calculus not only looks as if it would be extraordinarily useful to a monkey in a complex society, it also displays the hierarchical organization so characteristic of language. It is the same sort of skill that we deploy every day when we disentangle sentences with many levels of grammatical nesting. Moreover, it displays the linguistic design feature "displacement." Relations such as "Phil supports Joe" are not events taking place now, but abstractions based on the integration of many events that have taken place in the past. Thus a dominance calculus seems an obvious preadaptation for the development of language.

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