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Estuaries, apes, and the evolution of language a response to Perinat and Llorente

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Estuaries are places on Earth where rivers join the sea. Such places constitute some of the most nutrient-rich and productive habitats on our planet. Science, just like Earth, also has its estuaries, formed not by waters of diverse origins but by the confluence of diverse disciplines. And just like Earth's estuaries, science's estuaries are rich, filled not with organic and inorganic nutrients but with vibrant ideas that contribute to the advancement of knowledge. The two commentaries that followed my article illustrate how varied and interdisciplinary our field has become. In just a few pages one can find ideas from ethology, linguistics, neuroscience, philosophy, primatology, and psychology. This is a diversity that we have to promote and preserve, while at the same time engaging in a constructive dialogue.

Adolfo Perinat offers us a timely and insightful analysis of some of the key ideas developed in the target article. He is right in pointing out that the notion of symbol used in the article is rather shallow. It only scratches the surface of what some linguists and philosophers understand by the notion of symbol. By the way, not all linguists and philosophers agree on what a symbol is. Nevertheless, there is no question that, for many of them, the conventional cultural aspect mentioned by Perinat is a crucial one. As far as we know, there is very little conclusive evidence that nonhuman apes (henceforth apes) understand symbols as social conventions. In fact, the motivation to share psychological states may represent a key cognitive difference between humans and apes (see Tomasello, Carpenter, Call, Behne, & Moll, 2005).

One may object that assessing this shared component is riddled with empirical difficulties. This may be true to some extent but other aspects that we routinely observe in human infants also appear to be missing in apes. Apes quite readily borrow the use of human conventions, but do they also invent them with regularity? The answer so far seems to be a negative one. Such lack of inventions may indicate that their representational capabilities are not sufficiently developed compared to those of humans. Both Llorente and Perinat mentioned this aspect in their commentaries. Interestingly, they hold opposite views. Whereas Llorente argues that there is evidence of symbolic play in apes, Perinat finds the evidence available unconvincing. Over the years, I have come to appreciate the importance of this issue more and more, and it is fair to recognize that Perinat pointed out its significance to me many years ago (see Perinat, 1993). In order to clarify this point, additional data will be required because the anecdotal reports available on this topic, although informative, have little power to resolve the issue.

The reader may be wondering at this point, why settle for a minimalist notion of symbol, it may simply muddle the issue up. It is true that if the goal was to determine whether apes use symbols as humans do, we should not settle for a minimalist approach. But this, in my view, is not the most important aspect of our endeavor. The most important use of comparative data is to analyze the similarities and differences among species and the changes that occur both during ontogeny and phylogeny. Apes do not have language, that much is clear, but language is not a monolithic structure. Instead, it is formed by multiple components. Some of these components are ancient and predate the time in which humans and all living apes shared a common ancestor, while other components are a relatively recent development in the human lineage. If we want to know how the capacity for language evolved, our closest primate living relatives can offer us some important clues.

This analysis is particularly important in the light of classical ethological analyses of animal communication which have traditionally considered nonhuman communication as preprogrammed, rigid, and emotionally laden. Looking at it in this way, there is a rather wide and deep chiasm between animal communication and language (or between human and nonhuman thought). But is this chiasm as wide and deep as some scholars have proposed? Our minimalist notion of symbol has helped establish that ape symbolic communication is not preprogrammed, but flexible and emotion free. Then, what about reference and displacement? Again, Perinat's analysis of the importance of intention in the sender as a key ingredient of reference is well-aimed. It is true that monkey vocalizations may not be truly intentional. In fact, it has been argued that most of the work in getting the message across is done by the receiver, not the emitter of the signals. But are all signals the same? Unlike vocalizations and facial expressions, the production of which individuals have little control over, gestures are intentional even from the emitter's point of view. Means-ends dissociation, response waiting, and persistence are some of the features that Bates and others used as a diagnostic tool. Each of these criteria has been documented in ape gestural communication (see Call & Tomasello, 2007 for a review). The intentional nature of gestures is therefore well established. This should not be surprising given that instrumental actions often constitute the cradle of gestures, and there is ample evidence that apes use actions in an intentional manner, for instance, in problem solving situations. The prominent role that I am assigning to gestures fits well with Llorente's views on the role of gestural communication in the evolution of language. I fully agree with Llorente and others that gestures (and the cognitive machinery supporting them) may have been crucial components for the evolution of language.

Perhaps the emphasis on intention is mostly placed on the issue of its communicative goal. Here we can distinguish between informative, declarative, and imperative communicative intentions. Whereas imperatives are well-developed in apes, declaratives are rare, not to say inexistent -something that has been linked to the paucity of shared psychological states as mentioned before. With regard to informatives, the evidence is mixed and, as far as I am concerned, the jury is still out on that one. Nevertheless, the evidence that has accumulated on intention and goal reading in the last decade suggests that apes are not only guided by their own intentions but are also sensitive to others' intentions (see Call & Tomasello, 2008). One crucial unresolved issue raised by Perinat is whether, when apes do not understand something, they try to understand it. In other words, would apes seek clarification when the message is unclear? This is an interesting and important question that awaits future research.

With regard to displacement, Perinat, following Hockett (1960), places great emphasis on future projection rather than on remembering the past. By the way, the evidence about the gorilla King reporting on past events is not anecdotal, it is based on a controlled experiment. Similarly, the experiments on speech comprehension in bonobos have appropriate controls. I do not think that dismissing those studies on the basis of their anecdotal nature or poor experimental control does them justice. Empirical rigor, however, has to be applied in both directions and Llorente's use of two anecdotes of pointing in wild apes to bolster the existence of pointing among wild apes is also questionable. If the result of thousands and thousands of hours of observation is that pointing in wild apes has been observed twice, I think that the most sensible conclusion is that this behavior is extremely rare, and one has to wonder about its potential significance in the apes' natural gestural repertoire.

But let me return to the issue of displacement because there is indeed evidence that displacement may also occur in relation to future events. Although apes do not spontaneously announce their impending plans for action, they can be trained to do so. It is as if they do not possess the inclination to do it spontaneously but they can do it when requested. Granted, impending action still spans a very limited temporal frame. However, other recent data has shown that apes can save tools for future use at least of a few hours (Dufour & Sterck, 2008; Mulcahy & Call, 2006; Osvath & Osvath, 2008). These findings are particularly relevant given that Hockett precisely used the example of tool use in hominids to make the point about possessing an extended forward-looking temporal

horizon. It appears that forward-looking temporal horizons are not an exclusive province of human beings either.

I will finish with a conclusion and a corollary that has come with impetus to the surface of one of science's estuaries. The conclusion, to reiterate the key message of the target article, is that artificial communicative systems and/or enculturation (ACS+E) neither awaken dormant capacities in apes nor create new ones that non-enculturated apes lack. Apes already possess rich cognitive processes that include attributing some psychological states to others and planning for future actions albeit with a more limited scope than humans. More likely, ACS+E allow us to have a glimpse of those cognitive processes and allow apes to make them public. In contrast, other cognitive processes such as shared intentionality or symbolic thought may be uniquely human. The corollary is that language is not needed to create those thought processes, at least those that have been described in apes. In fact, it may be the other way round. It is precisely because those processes found in apes were in place that language had the possibility to evolve in our human ancestors.

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