

form: Both the human and the monkey utterances appear to be intended to get another individual to *do* something (produce the dessert, flee from the leopard, etc.). In this sense, they are both "protoimperatives" (Bates et al. 1975). The utterance, or speech act, is used to produce a particular outcome in the *physical* world - obtain an object, cause someone to move, and so on. (Human infants also point or gesture to achieve the same effect.) But the comparison between human and monkey communication breaks down, I suggest, when the wider repertoire of human infant communication is considered. Whilst monkeys appear to be restricted to using words *only* as imperatives, human infants - right from the beginning of their communication - use words not only as imperatives but also as *declaratives* (Bates et al. 1975). Protodeclaratives (which may also be a single "word", or even a single, silent gesture) function not primarily to obtain a result in the physical world, but to direct another individual's *attention* (their mental state) to an object or event, as *an end in itself*. Thus, a human toddler might say "Plane!" apparently to mean, it's a plane! or, Look! A plane, and so on. Here, the child communicates simply to share interest in something. This is "commenting on a situation for its own sake. In this sense, the use of communication strongly suggests that the speaker is trying to affect the listener's *mind* (Baron-Cohen 1989a; 1991b). There is no overtly physical goal: The child is not trying to obtain the object, or get the listener to act, and so on. C & S's claim that monkeys are also "commenting" (p. 173) may therefore need sonic qualification: Insofar as monkeys comment, they appear to do so to produce physical, not mental effects. Monkeys communication may thus resemble human children's communication in its imperative but not its declarative use. As with the question of whether monkeys have a theory of mind, the evidence appears to still lie quite fragile as to whether monkeys can use "words" purely as declaratives. We need further research of C & S's excellent quality to answer the question of whether monkeys or any other nonhuman primate can produce genuine declaratives. This is not just a question about communication: It may also be critical for understanding the evolution of a theory of mind, in that proto-declaratives and other forms of "joint-attention" behaviours have been proposed as a precursor in the development of a theory of mind (Baron-Cohen 1991b).

## New elements of a theory of mind in wild chimpanzees

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Cheney & Seyfarth's (C & S's) book makes it clear that rather little is known about the SOCIAL cognition of primates. They stress this point repeatedly and correctly remind us to be careful whenever we want to generalize. The role of scientists, however, is to draw conclusions, and given the present state of knowledge, they are bound to be proven wrong at one time or another when new observations are reported. Let me address some of the points related to the theory of mind that would benefit from new observations made with the Tai chimpanzees. *Imitation as a measure of attribution*. Imitation has recently become the centre of a debate concerning the transmission process in primates. The conclusion, supported by C & S, is that primates are not copying each other; only humans do so. The new observations that cast doubt on such imitative abilities were mostly earned out in restricted, captive settings within artificial groups, however. Imitation presupposes a natural and trustful relationship between two individuals that should motivate one of them to copy a specific behaviour of the other. In comparison, captive studies provide a rather inappropriate social environ-

ment. In an attempt to investigate the imitative abilities of the chimpanzee, Tomasello et al. 1987) observed that captive young chimpanzees fail to copy the behaviour of others who were throwing sand or using reaching sticks. Well-fed zoo chimpanzees may not be very motivated to use a stick and even less to throw sand (interestingly enough, only four out of seven young chimpanzees and none of the older ones tested showed any interest in the raking tool during the test trials). In addition, the models (an adult female) may not have had the prestige of a mother or a familiar adult male to inspire imitation of their behaviour. Finally, the fact that rake use in an American zoo is not imitated by the chimpanzees tells us nothing about the learning processes involved in termite fishing or nut cracking by Gombe or Tai chimpanzees, two of the behaviours considered by some as possible candidates for cultural transmission through imitation. Evidence of imitation in chimpanzees must hence be sought in animals possessing behaviours that are candidates for cultural transmission, for example, the imitation of termite fishing should be studied with Gombe chimpanzees and nut cracking with Tai chimpanzees (Boesch, in press a).

*Empathy as measures of attribution*. As C & S mentioned, Gombe chimpanzees may show compassion for wounded individuals, but only between close kin. Whenever a nonkin presents a wound to a chimpanzee, this induces a reaction of fear or disgust (Goodall 1986), a reaction similar to that described in monkeys. Tai chimpanzees, however, totally independent of kin relationship, were regularly seen to tend wounded animals for extended periods of time. Once this care was observed for more than 2 months (Boesch in press b). Individual reactions tend to indicate that they are aware of the needs of the wounded, e.g., they lick the blood away and remove all dirt particles with fingers and lips, as well as preventing flies from coming near the wounds. In addition, empathy for the pain resulting from such wounds was clearly demonstrated by the reaction of other group members: After having received fresh wounds from an attack of a leopard, the injured individual is constantly looked after by group members, all trying to help by grooming and tending the wounds. Dominant adult males prevented other group members from disturbing the wounded chimp by chasing playing infants or noisy group members away from his vicinity. In addition, as wounds handicapped the movements of the injured animal, group members remained with him as long as he needed before he was able to begin to walk again: some just waited, whereas others would return to him until he started to move (three times the group waited for four hours at the same spot). Whenever he stopped, they waited for him. Such a difference with the Gombe chimpanzees may be explained by the high predation pressure Tai chimpanzees suffer from leopards (Boesch, in press b).

*Teaching as a measure of attribution*. C & S agree with most authors that teaching is unique to humans. Contrary to C & S's proposal that teaching only requires attributing ignorance to others, I suggest that teaching requires much more: In most situations, the naive individuals has some knowledge of the task already, and in teaching one must not only attribute knowledge to the other individual different from that of the teacher, but this knowledge must be compared with the teacher's own in order to determine what aspect is incomplete or inappropriate and needs to be changed. This comparison between two mental knowledges has to be done accurately enough for the teaching to be understood by the naive one and to improve his performance. Apart from the cognitive capacities needed to make judgements about another individuals errors and needs, biologists would say that teaching should appear only when it is necessary for improving the survival and reproductive abilities of an individual.

The lack of observations on teaching in apes might only reflect the fact that we have looked for tasks that didn't require teaching in order to be not normally acquired. The nut-cracking behaviours

in Tai chimpanzees require many years to be fully acquired and the mother who normally shares the nuts with her infant must at a certain moment interrupt her investment to be able to invest in a second infant. This period may be costly to the first infant, as it does not fully possess the nut-cracking behaviour. Nut-cracking may therefore be one of the rare behaviours that could force the mother to accelerate the learning process of her infant if she does not want to harm her own fitness. In fact, Tai chimpanzee mothers were observed to teach some aspects of nut-cracking technique to their infants who already had some of these skills, either by demonstrating the right movement or by correcting an error in the infant's technique (Boesch 1991).

Cheney & Seyfarth's synthesis of their observations on rhesus monkeys is fascinating and I can only hope that their example will be followed with some of the monkeys and apes species about which we know so much less.