
General Discussion

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General discussion

H. J. JERISON (*University of California, Los Angeles 90024, U.S.A.*). We have heard surprisingly little during this meeting about evolutionary theory as a source of synthesis for the extensive and somewhat chaotic catalogue of intelligent animal behaviours that have been described. The question raised at the end of the meeting of whether their smaller brains (about one third the size of human brains) limit the capacities of chimpanzees to learn human language is clarified if treated as an evolutionary question. It is on grades (not ‘clades’) of phenotypic evolution.

Phenotypically, language may be defined by its status in normal human adults. The phenotype has its ontogeny, of course, as well as a variance and ‘mean value’. (Pathologies that generate outliers are excluded from the analysis.) Brain size is associated with language in living humans primarily because so large a fraction of the brain (perhaps 50%) has been associated with language and language-like functions, which include functions of the ‘minor’ hemisphere. Evidence on the evolution of brain size that is legitimately applied to issues about the evolution of language must be based on ‘mean values’ of brain size. Similarly, if one considers brain size in chimpanzees as relevant for such evidence the comparison must be between mean values for chimpanzees and mean values in humans. It is appropriate to note, for such an argument, that the coefficient of variation for brain size is about 10% for both humans and chimpanzee adults, so variability is not at issue.

In this perspective, it is unlikely that the impressive results reported on chimpanzee ‘language’ refer to the same adaptation in chimpanzees as in humans. Rather they are better interpreted as showing that we have badly underestimated the cognitive capacities of chimpanzees, and that teaching them to communicate with a system of signs derived from human language has enabled us to form a better idea of their cognitive capacities. This entry into the ‘mind of the chimpanzee’ (opening, also, for some cetaceans according to Herman’s recent work) is an important accomplishment by comparative psychologists, not to be muddled by raising the issue of language.

L. WEISKRANTZ, F.R.S. One of the points to have emerged from this meeting, I believe, in exposing the current ‘state of the art’, is that the issues involved in trying to relate the cognitive communicative capacities of the chimpanzee to the achievement of ‘language’ are not only still open, but are more complex than was imagined 20 years ago. One question, for example, is whether ‘intentionality’ is a necessary criterion for attributing *linguistic* communication and, if so (which is by no means agreed), how intentionality can be recognized and identified. It seems to me that the behavioural criteria are likely to be ostensive rather than logical, with the attendant difficulties in resolving disagreements about judgments at the empirical and observational level. Another question concerns a stimulus that has become associated, by pairing, with reward or punishment: when does it qualify as a meaningful symbol and, especially if it is generated by the animal itself (as in making an A.S.L. sign), when does it become a word? Incidentally, given the difficulty that human subjects have in mastering lists of ‘paired-associates’ and the not unformidable task it is for an animal to acquire lists of neutral

S-S associations, it is somewhat paradoxical to see the phrase ‘mere paired-associate learning’ being used pejoratively! That aside, the empirical evidence itself as regards the capacity of animals to manipulate strings of tokens or A.S.L. signs is far from complete and, as we have seen, is still controversial, although I believe the issues have become clarified as a result of the meeting.

These issues cannot be settled by making assumptions about or appeals to brain size *per se*, because it will be necessary to say what it is, logically and empirically, that allows one to judge when a brain has reached a ‘threshold’ size in evolution to grant it the capacity for language (leaving aside the questions that arise from considerations about continuity in evolution). Nor would there be agreement that size *per se* is the critical factor: there are those who argue that there is a particular, possibly unique, organization of the human brain that endows it with linguistic capacity even when the brain is undersized in other respects through constitutional disorders or genetic mistakes. Nor is it easy to estimate the fraction of the human brain associated with language – this can hardly be 50% given that the demonstrable ‘language’ regions constitute much less than the whole of one (the dominant) hemisphere – but stretching the category to include ‘language-like functions’ begs the question of just what cognitive skills are ‘language-like’ and how they might differ from ‘language’, especially as Professor Jerison grants that the cognitive capacities of the chimpanzee allow it to communicate with a system of signs. And so we return to the very issues that are as yet unresolved.

But all will agree with Professor Jerison’s remark that the work of contemporary comparative psychologists, much of it reviewed here, has provided an important entry into the ‘mind of the chimpanzee’ (and not only the chimpanzee). As always, the end of one meeting makes one regret that it could not be followed immediately by a second that would concentrate on those issues revealed but left unresolved by the first, and might also allow the evidence to be extended more widely to include not only the Cetaceans but also the invertebrates such as *Aplysia*, on which so much exciting basic neurobiological work on some forms of learning and memory is now being done.