

indicate that Nim has little language ability are the following. (i) An increase in vocabulary to 125 signs during the course of the training programme did not result in a related expansion in the mean length of utterance (MLU). This remained fairly stable over the course of the programme. (ii) There was little originality in Nim's utterances. A high percentage (87%) were classifiable as 'adjacent' (i.e. following the teacher's utterance without a definite pause) and a large percentage of these (~40%) were either imitations or 'reductions' (containing some of the utterances of the teacher and nothing else). (iii) Nim showed little evidence of the 'turn-taking' strategy which characterizes human conversation. Instead a large majority of his signs overlapped with those of his teachers — most of them interruptions which could not be construed as attempts to 'take the floor'.

To check that Nim was not an atypical case, Terrace *et al.* have analysed two films of Washoe which also include signing behaviour by Ally (Nim's full brother) and Koko, a gorilla<sup>7</sup>. Their analysis shows they claim that "Washoe's utterances were adjacent and imitative of her teachers' utterances . . . ninety-two percent of Ally's, and all of Koko's, signs were signed by the teacher immediately before Ally and Koko signed".

The Gardners hotly deny that Terrace's analysis is accurate, claiming instead that single frame and slow-play analyses misrepresent and distort the record. They also draw attention to the fact that Washoe frequently signed to herself when she was unaware of an observer, or when looking at pictures in magazines<sup>4</sup>. As things stand it will be some time before the technical and the statistical issues raised by Terrace's analysis can be resolved.

One conclusion which does emerge, however, is that where there is suspicion that some of an ape's signs are merely imitative of an earlier use in the same test by the teacher, the use of syntactic criteria including word order may reduce the danger of 'over-attribution' by the experimenter. To use these criteria it would be necessary to establish that the constituents of any utterance had particular meanings when presented in isolation, that signs in different linear combinations had different meanings, and that each order structure is not specific to a unique combination of signs. So far none of the chimpanzee language projects appear to have met all of these criteria — at least within the same study. Premack<sup>8</sup>, who trained a chimp, Sarah, using an artificial language based on plastic symbols claims that "chimps can be taught word order but only with explicit training . . .". He found no evidence that Sarah could produce structural innovations, although he claims she converted the trainer's (production) order of symbols and "produced sentences by systematic rearrangement . . .". On this latter point,

however, he offers no evidence. As for word understanding, the use of too few alternatives in the tests employed frequently leads to ambiguity as to what the chimp has understood. (For instance, the preposition *on* was taught in isolation such that word order was always a simple clue to the subject-object relationship specified. It would not have been had this preposition been contrasted with *under*).

Stronger evidence for grammatical competence comes from Project Lana<sup>9</sup> where chimps have been trained to use lexigrams from a language called Yerkish. A computer monitors the productions of the subject — achieved by depressing keys — which must conform to the rules of a correlational grammar before any requests can be honoured, e.g. *Please machine give chow period*. The words *please* and *period* are fixed features of the sentence frame to enable the computer to determine the beginning and the end of an utterance. Examination of the performance of the subject Lana over one month of training revealed that she composed on her keyboard "76 strings of 6 lexigrams that were grammatical sentences and that did not figure in any training programme, whereas during the same period she produced only 71, 6-lexigram strings that were ungrammatical"<sup>10</sup>. Clearly there is evidence here of innovation. However, the analysis did not include consideration of the communicative or the contextual appropriateness of these grammatical strings and it seems likely that not all of the constituent lexigrams in the strings carried an independent meaning for Lana. For example, *please* is an invariant feature of a sentence frame necessary to get the computer to accept a message. It is improbable, as Seidenberg and Petitto<sup>6</sup> point out, that the appropriate depression of this key suggests that the ape has a sense of politesse. More recent work on this project has shown, furthermore, that apes begin to use individual lexigrams as referents for objects and actions after they are able to produce ordered sequences of them to produce food. The apparent

ordering of signs must be rigorously analysed to determine the extent to which the sequences are controlled simply by lexical order rules independent of their (constituent) meaning.

Issues of syntax apart, it seems pertinent to ask what apes tutored in these various 'languages' have revealed about their mentation which could not be inferred from other aspects of their behaviour. The results thus far are ambivalent. On the one hand the content of ape language merely reaffirms the narrow incentive range within which the chimp seems to operate in laboratory situations. His favourite words seem to be those which invite the listener to donate food or drink, or which command attention (although this pattern may change when more work is carried out with mature subjects). On the other hand, the restrictions on semantic role which Terrace describes in the case of Nim (indexed by a marked restriction on the range of agents and beneficiaries, e.g. NIM, me, you and the names of other animates) are symptomatic perhaps of an egocentric form of thought — a characteristic of early stages of child development according to Piaget — not easily revealed by non-verbal tests. The response of apes to attempts to teach them the spatio-temporal conventions for reference to objects and events outside the immediate context of utterance should provide further important clues to the cognitive resources available to these enigmatic primates. □

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## 100 years ago

### HUMAN HYBERNATION

In the *Transactions* of the Royal Society Dr. W. Oliver has recorded the history of an extraordinary sleeping person named Samuel Chilton of Tinsbury, near Bath, who on May 13 1694, being then 'of robust habit of body, not fat, but fleshy, and a dark brown hair,' happened, without any visible cause or evident sign, to fall into a very profound sleep, out of which no art used by those who were near him could rouse him until after a month's time; then he rose of himself, put on his clothes, and went about his business of husbandry as usual; slept, could eat and drink as before, but spoke not one word till about a month after. In 1696, on the 9th of April, this youth fell off to sleep again, and although a heroic apothecary, Mr. Gibbs, bled him, blistered him, and scarified him, he slept on for seventeen weeks, waking up on August 7, not knowing

he had slept above a night, and unable to be persuaded he had lain so long, until going out into the fields he found everybody busy getting in the harvest, and then remembered very well that when he fell asleep they were sowing of the barley and oats which he now saw ripe and ready to be cut down. For six weeks of this sleep he had fasted, but after he awoke he went to work in his ordinary way, and continued to work until August 17, 1697, when, after complaining of shivering and cold in his back, and vomiting once or twice, he fell into one of his long sleeps once more. So he lay sleeping until November 19, when he awoke, said he "felt very well, thank God," ate some bread and cheese, and dropping off still another time, slept on until the end of January, 1698, and "then waked perfectly well, not remembering anything that happened all this while."