Behavioral and Brain Sciences Journal, Volume 01 - Issue 04 - December 1978
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TARGET ARTICLES

1. Premack, D., Woodruff, G. Does the chimpanzee have a theory of mind? BBS 1978 1 (4): 515.
2. Griffin, D.R. Prospects for a cognitive ethology. BBS 1978 1 (4): 527.
3. Savage-Rumbaugh, E.S., Rumbaugh, D.R., Boysen, S. Linguistically-mediated tool use and exchange by chimpanzees (Pan Troglodytes). BBS 1978 1 (4): 539.

What follows is a commentary on the above by A.Sloman
Sloman, A. What about their internal languages? *BBS* 1978 1 (4): 602.

WHAT ABOUT THEIR INTERNAL LANGUAGES?

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1 Fun, but so what?

All three papers are, of course, fascinating sources of information about some of the things chimpanzees and bees can do. It is comforting to have rigorous laboratory observations to reinforce and augment what every dog-owner or circus-goer knows about the rich mental life of other animals. No doubt anecdotal evidence cannot be as important for the advance of science as papers which resound with such phrases as 'the altered performance was again accompanied by a noticeable orientation of the attentional response' (SRB page 11). Behaviourists will surely cower and tremble before PW's ingenious use (page 25) of the anti-behaviourist beliefs of apes! And finally, we must welcome Griffin's use of philosophy to push away some behaviourist barriers to scientific insight, even if both mentalists and behaviourists prove unable to provide theories with deep explanatory power.

Yet despite their virtues, and the evident satisfaction with which these authors put down their intellectual rivals, I find something sadly lacking: an awareness of deep problems and a search for deep explanations. I'll try to enlarge on this.

2 Deep science and shallow science

Looking back over the history of science we can distinguish three major types of advance:

1. the collection of facts expressible in previously available language,
2. the extension of our thinking powers by the creation of new concepts, taxonomies, symbolisms and inference-techniques, and

3. the construction of generative explanatory theories about underlying mechanisms, a task which has much in common with engineering design.

The collection of facts (including laws and generalisations) is intrinsically interesting, and also important for the other two processes, since facts determine what it is that our theories need to explain and help to show up inadequacies in our descriptive and explanatory resources, and they may even be of great practical value. But facts alone give us no new understanding, no new insight into underlying mechanisms, no new ways of thinking about old phenomena.

Are the authors of these papers merely concerned to collect facts? Clearly not: they are also deeply concerned to learn the extent of man's uniqueness in the animal world, to refute behaviourism, and to replace anecdote with experimental rigour. But what do they have to say to someone who doesn't care whether humans are unique, who believes that behaviourism is either an irrefutable collection of tautologies or a dead horse, and who already is deeply impressed by the abilities of cats, dogs, chimps, and other animals, but who constantly wonders: HOW DO THEY DO IT?

This is the sort of question which is at the heart of all science (and philosophy), namely: 'How is this possible?' For example:

How is it possible for a chimp to interpret flat pictures as representing three dimensional scenes involving agents with purposes (PW)?
How is it possible for a chimp to learn to fish for juice with a sponge on a string (SRB)?
How is it possible for a bee to find its way to a specific location (G)?
How is it possible for a chimp to pull a blanket with just the right force to retrieve a ball?
How is it possible for a chimp to learn that after being shown a videotape she is to select a photograph from a box left by the experimenter before he departs, and then she is to place the picture alongside the television set, and finally ring a bell to recall the experimenter (PW, page 4)?
How can a chimp realise that tapping another's hand is an adequate method of getting the latter to relinquish the straw through which he is sucking juice (SRB figure 6e)?
How does the other chimp know that that is the intention?
How can they learn to push buttons?
How can they remember where to look for the effects?
How can they learn associations?
How can they use them?
How can they combine previously learnt actions into larger wholes (SRB page 15)?
How can they use so-called iconic symbolism (SRB page 19)?
How can they form beliefs?
How can they react to unintended cues from experimenters?
How can they form beliefs about the intentions or beliefs of others (all three papers)?
How can they have likes or dislikes (PW page 11)?

Of course, all these, and myriad other questions suggested by the papers, may be asked about human beings too! But when the authors begin to broach such questions, for instance as G does at several points, they hardly seem able to go beyond anti-behaviourist incantations which re-iterate what has always been obvious to anyone with common sense: that animals have experiences, beliefs, hopes, fears, doubts, surprises, intentions, plans, and so on. As if we already knew how to explain these things, and the only problem was to collect more examples.

3 Am I being unfair?

One cannot do everything, least of all in a short scientific paper, even a speculative one, like Griffin's. Surely a scientist is entitled to choose an area of research and pursue it? Surely it is unreasonable for me to criticise these authors for not pursuing the questions which interest me? Perhaps, but I suspect that it is not merely a difference of interest that is at issue.

Although the questions I have formulated, are still a long way from being answered, one thing seems clear from the few serious attempts which have been made to gain some insight into these matters:

> *all the abilities in question seem to depend on internal processes in which symbols of some kind are constructed, stored and manipulated: they use inner languages.*

For some first crude attempts at theorising about such internal processes see Miller et. al (1960), and more recent work in Artificial Intelligence reported in Sussman (1975), Winston (1975, 1977), Boden (1977), Lindsay and Norman (1972). What sorts of internal symbolisms are required? How are they used? How are they acquired? Are very different kinds used for different purposes? How are they stored? How did they evolve? – these are all basically unanswered questions. But if it is even remotely plausible that in order to perceive, learn, find their way around some terrain, form and execute intentions, etc. animals must make use of internal symbolisms, then surely one might expect discussions of the ability of apes to use *overt* languages (sign-language, push-button language, gesture, or whatever) to be related to speculations about their *inner* linguistic competence?

The essence of language is often thought to be its use in communication. What I am saying is that there is a more fundamental class of uses – for storing information and procedures, and for making inferences, forming plans, guiding actions, etc. In every way this is more basic: it evolves earlier, it develops earlier in individuals, and it is a prerequisite for the overt use of language for communication.

This inner symbolic competence is clearly quite profound even in relatively unintelligent animals, to judge from the enormous difficulties Artificial Intelligence workers have experienced in their efforts to simulate apparently commonplace abilities. (I am not talking about physiological processes. Studying the physiology of a computer can tell you very little about the programs which run on it, since these may be radically altered without physiological change.) Could it not be the case that by theorising about such (mostly unconscious) inner symbol-manipulating processes (going far beyond traditional mentalists in precision and detail), we might be able to form a framework to guide research into the overt linguistic abilities of apes, and possibly other creatures? And then we shall not be dependent for our scientific motivation on a concern about the uniqueness of human beings, or semantic quibbles about the essence of language! Unless work on the behaviour of animals is placed in the context of attempts to theorise about underlying mechanisms, it is little more than ethological rubber-necking (often done very effectively in TV documentaries).

4 On experimenting in the dark

In so far as claims are being made about controlled experiments, we have a right to ask 'How do the experiments *work*?' A scientist should not be satisfied with an experiment using some complicated piece of apparatus whose behaviour he could not explain. Yet all the experiments described in these papers require the animals to deploy very complex cognitive skills: perceptual skills, learning skills, problem-solving skills, memory-skills. Without the use of these skills, the animals would not be able to acquire or display the other skills which are explicitly being studied: such as the ability to use symbols in a co-operative situation, or the ability to think about somebody else's predicament. Why are the researchers content to study the latter skills without any theory of the mechanisms underlying the skills which are part of their experimental set-up? Without such understanding, the observed behaviour is subject to radical ambiguities of interpretation. How can we tell to what extent the experimentalists' descriptions are naively anthropomorphic?

I suspect that many experimenters are as unaware of the need for explanations of the kinds requested above as the child who feels no need for an explanation of why unsupported apples move downwards. For instance SRB (page 21) assumes that 'deferred imitation' might explain some of Washoe's behaviour, and PW (p 9) suggests that 'physical matching' might be an explanation of some of Sarah's problem-solving.

5 Conclusion

Of course I cannot now give explanations, and that is the main reason why my criticism is so unfair. But I have a strong suspicion that in the long run we shall all learn more if we spend a little less time collecting new curiosities and a little more time pondering the deeper questions. The latter are harder and don't generate publications so easily: but the questions are important and we need more good young scientists to be trained to think about them. The best method I know of is to explore attempts to design *working* systems which display the abilities we are trying to understand. Later, when we have a better idea of what the important theoretical problems are, we'll need to supplement this kind of research with more empirical studies. Compare Pylyshyn 1978.

Finally an ethical comment. The discoveries reported in the papers by SRB and PW show that at least some apes have a profound potential which they cannot realise without human intervention. (It is not clear how far the use of computerised equipment is essential.) This is no different from the situation with humans: without the benefit of an elaborate culture a human child will not develop the ability to talk, to play or enjoy music, to solve mathematical problems, to puzzle about the workings of the human mind. It is now widely accepted that people have a *right* to the kind of education and social opportunities which will enable them to realise their potential – not all their potential of course, for instance not the potential to become vicious, which possibly lurks in all of us. Whether they have the right or not, it is clear that for the vast majority of human children the opportunities for development just are not available – and often the right is not recognised. But insofar as they have the right, it would seem that similar reasons exist for ascribing such a right to other animals. Where this argument ends I cannot tell, but at least it should be borne in mind by all who are interested in finding

out just how much apes can be helped to become human.

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