The chapter by Evans on racing is provocative, particularly because it casts a very different light on the dangers of racing than does the American Veterinary Medical Association Symposium of Equine Welfare (Mundy G D [2000] Racing. *JAVMA 216*: 1243-1246).

The most disappointing chapter was that on work horses. The only information on evaluating harnessing was in a figure legend.

All in all this is a good contribution to the welfare literature. Horse are often considered to be pampered companion animals with no need for consideration from the welfare community but, as this book points out, there are many areas in which the welfare of horses is not optimal.

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The Alex Studies: Cognitive and Communicative Abilities of Grey Parrots

I M Pepperberg (2002). Published by Harvard University Press, Fitzroy House, 11 Chenies Street, London WC1E 7EY, UK or 79 Garden Street, Cambridge, Massachusetts, 02138, USA. 434 pp. Paperback (ISBN 0 674 00806 5). Price £12.95.

Imagine the scepticism of 'serious scientists' if somebody suggested investigating animal cognition by chatting with just one single grey parrot. This is exactly what Irene Pepperberg initially did. And she succeeded. In her interaction with her African grey parrot 'Alex', and helped by a number of students, she left story-telling far behind and showed beyond reasonable doubt that it is not only possible to communicate verbally with a bird, but also to use this approach as an immensely revealing window into the mind of an animal. In the meantime, she employed a crew of four African grey subjects, with Alex remaining the central figure.

This approach has revealed that an African grey can indeed use speech referentially. Hence, it is possible to communicate directly with a parrot, which may be a great advantage over the use of pictorial symbols in the communication with great apes or dolphins. And parrots not only copy the sound of human speech, but also are actually capable of using words in a human-like way. By using this tool, Irene Pepperberg has shown that Alex, her congenial partner, can form categorical concepts and can tell apart same from different. In fact, Alex is in command of a sizable vocabulary, he can form simple sentences and learn to label and number object categories, shapes, materials and colours. He can compare sizes and can talk about absent items. Furthermore, the author has tackled questions related to how parrots acquire speech and how parrot speech differs from human speech.

The key to success was the model/rival (M/R) training technique in alignment with the specific social dispositions of this species. Basically, Irene Pepperberg hand-raised this bird and served as the main model. In front of the bird, she talked about a certain item with a colleague, who served as the social rival of the bird. As soon as Alex correctly pronounced the word naming the item for the first time, he was rewarded by social attention and finally by the object itself, which he then could explore (destroy). In contrast, simply rewarding Alex with food probably would not have produced positive results, as it never has in the past with other parrots. Learning simply requires the proper motivational and social context. For this kind of work it is mandatory to be socially close to the subjects. Not reported in the book is the anecdote that when travelling, Irene has to talk to her African greys regularly to keep them happy.

For the past few years, Alex has no longer been on his own. Conspecifics Griffin, Kyaaro and Alo have joined the team. They help to solve related questions and are partly tutored by Sir Alex himself. But these birds play only a minor role in the book. Even with Alex alone, it should be quite clear that an 'n' of 1 may still reveal revolutionary insights. From a formalistic point of view, the results achieved with Alex are valid only for Alex. However, Alex, by being an African grey parrot, has shown that the potential is in the species. Not all his conspecifics may be as bright or as cultured. By the same token, not all humans have the genius of Johann Wolfgang von Goethe, Charles Darwin or Richard Feynman. But here, the point is not whether the average African grey in his Congo rainforest habitat could compete with Alex in the experiments performed by Irene. The cognitive potential within this parrot species has been demonstrated. If Alex can, in principle all African greys can. Irene Pepperberg has shown that cognitive skills which have recently been attributed to humans, a few great apes and dolphins may be more widespread. Hence, over the vertebrate pedigree, species may not differ in qualitative cognitive skills as much as our idealistically educated predecessors would have hoped. Through contributions such as this, it becomes increasingly clear that non-human animals differ in their cognitive abilities from humans mainly in the quantitative and contextual expression of these traits, rather than qualitatively. "All animals are in humans, but not all humanness is found in animals", as Konrad Lorenz put it.

It is not too surprising to find in a vertebrate the implicit cognitive dispositions for labelling and numbering object categories and recognising shapes, materials and colours. The ability to form categories and concepts has been previously demonstrated in a number of animals. These basic cognitive tools are probably an indispensable means of getting to grips with complex environments. The human socialisation and enculturation that Alex experienced during hand-rearing and later on may have contributed to the optimal development and expression of these tools. Individuals need to be able to learn relevant stimulus categories and to fade out irrelevant ones. But the capability of forming concepts *per se* does not mean that animals are able to communicate freely about it nor necessarily 'understand' what they are thinking or doing.

Instinctive behaviour is defined by the consistency of its characteristics and its high heritability, as well as by the fact that it can be triggered in a reflex-like way by certain stimuli. There is no *a priori* reason to assume that the basic cognitive tools for categorising, numbering and concept-formation are anything other than 'cognitive instincts'.

However, this is not true for Alex. He, indeed, seems to 'understand' what he is thinking and he is able to express his intentions. Hence, Alex's brain does not 'think for him' in a reflex-like, unconscious way. 'He' actually uses his brain to think (even though there is no reason to assume that 'he' exists anywhere other than inside his own brain). Alex is able to express his will and explicitly and intentionally use his abilities. Such statements would not only have had no scientific foundation just 20 years ago, they would have been in fundamental opposition to the scientific mainstream, particularly in the US. Even today, talking about the 'will' of a parrot opens a Pandora's box of questions at the interface of biology and philosophy. What does the term 'consciousness' mean with, and for, Alex? What about the 'self' of this parrot? Can we ever penetrate the qualia of conscious thinking of Alex and other animals? Probably not. But we will be able to learn more about the features of these qualia and thoughts. A book review is certainly not the place to discuss this at length. At the time when she started, Irene Pepperberg had the stamina and courage to move against the mainstream and to open that Pandora's box, initially supported only by a minority of fellow scientists.

From the beginning of the 20th century right towards its end, behavioural biology on the US side of the Atlantic was dominated by comparative psychologists or so-called 'behaviourists'. Skinner & Co. considered evolutionary history and the ontogentic process as irrelevant for the explanation of cognitive phenomena. For them, individuals were essentially learning automata, starting out with *tabula rasa* brains. Early ethologists on the European side of the Atlantic advocated the other extreme: in essence, Lorenz & Co. held that most behaviour was 'innate', leaving only little space for learning; animals were essentially stimulus–response machines. Therefore, behaviourism and early ethology both created a very mechanistic view of animals, which remained mainstream for much of the 20th century.

Today, a synthesis of the above approaches acknowledges the importance of highly heritable dispositions formed by the evolutionary process. These dispositions also include the 'instinct to learn', as Peter Marler once beautifully put it. Today, there also seems to be agreement over the generality of the basic learning mechanisms, such as habituation, Pavlovian and operant conditioning and some social mechanisms of learning. Cognitive ethology was central for the dismissal of the view of animals as automata without feeling and consciousness. Besides Don Griffin, Allan Kamil, Peter Marler, and a few others, Irene Pepperberg is certainly among the pioneers and most important proponents of this recent development.

This is far more than an academic dispute. For example, during much of the 20th century this mechanistic view of animals allowed their abuse in large-scale industrial production units. A major argument was that unconscious individuals would not suffer stress, discomfort or even pain. Behavioural biologists had a hard time arguing against evident animal welfare violations on a scientific basis. This has changed for the better with the advent of cognitive ethology in general and with Irene Pepperberg's studies with Alex in particular. It became increasingly clear that non-human animals have analogous or even homologous cognitive abilities similar to the human animal. This was plausible ever since Darwin proposed the phylogenetic continuity between species, and was also supported by the notorious evolutionary conservatism of nervous systems. Thanks to the progress made in cognitive ethology, we today not only speculate, but know, that animals have some consciousness about their thoughts and emotions, and hence we know that animals may suffer when inadequately kept.

Irene Pepperberg not only had the scientific vigour to produce her results basically with a single experimental animal (or companion, as she would probably insist), but also is a great communicator of her results. Hence, she and Alex are among the best known researcher–subject dyads worldwide. But to understand what all the fuss is about, one needs the details of this book, which Irene Pepperberg has evidently written for fellow scientists as well as the educated layman. Because of the author's intellectual integrity, it is not exactly easy reading, but it's worth it. Numerous literature references and the organisation of chapters also turn a book about Alex into a collection of reviews of a number of cognitive topics. Hence, this is an important book in many regards. It seems particularly valuable for teachers and decision-makers. It is one of those books that are not philosophical in the sense of bothering too much with meta-levels, but may still significantly affect one's view of the world. It is a book which has the potential for sustainably improving the relationships between humans and the other animals on our planet.

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