

Pearce, J. M. 1991: Introduction to animal cognition. Lawrence Erlbaum, Hove, Hillsdale. 327 pp., numerous figs, paperback £11.50. ISBN 0-86377-057-6.

Reviewed by Juan D. DELIUS, Lehrstuhl Allg. Psychologie, Univ. Konstanz.

This concise text-book, first published in 1987, is at present available in its third, unmodified, reprinted edition. Dealing, as it does, with a fast-developing field of study, it is now unavoidably outdated in places regarding the factual material it presents. Concerning the theoretical framework, the progress in animal cognition has been less dramatic and so the book is still very useful for an introductory course, the more so as there is no obvious more modern replacement. It is written in a pleasantly straightforward style that mixes theory and fact in an easily comprehensible, very readable manner.

In keeping with the fact that animal cognition is not much more than a fashionable and convenient new name for some old animal behaviour themes, PEARCE mercifully does not attempt any formal definition. Instead, in a series of rather abrupt jumps, the opening chapter deals with the characterization of intelligence, its distribution among animals, the theory of evolution, the methods for studying intelligence, and brief sketches of the contributions of some of the pioneer students of animal learning (THORNDIKE, PAVLOV, HULL, TOLMAN).

Ch. 2 deals with the representation of stimuli. In fact, it deals with the perception and the memorization of stimuli, and particularly with the codes that may be involved when more complex stimulus arrays are stored in memory. A rather staid theoretical framework, with serial computer analogies still showing through, is used to discuss these issues. A mention of neuronal nets would have been up-to-date even in 1987, at least in the context of stimulus categorization. Here, one notices that the book is a bit dated (compare PEARCE 1994). The rather sceptical treatment of the counting abilities of animals does poor justice to the work of Otto KOEHLER and his students. A revised edition, when it comes, will have to acknowledge that recent research has shown many of his/their conclusions to be quite correct (see for example EMMERTON & DELIUS 1994).

Even though memory is the product of learning, Ch. 3 deals with the stages of the former before the processes of the latter have been explained. A similar kind of reverse order applies when PEARCE deals first with long-term memory phenomena before short-term memory processes have been treated. However, this logical inversion does not detract from the quality of the presentation because, in fact, each of these memories has been studied largely in isolation. Regardless of this, this breezy chapter manages to show that the repression which animal memory research suffered under the long reign of radical behaviorism is definitely over.

The discussion of associative learning presented in Ch. 4 is strongly centred around the influential theory that RESCORLA & WAGNER conceived in the early 1970s. Ch. 5 expands the theme by considering the mechanisms of conditioned attention. Organisms are limited in information processing capacities and must, therefore, be selective. Perhaps not surprisingly, the home-grown PEARCE-HALL theoretical model is found to provide the best account for several of the relevant phenomena. However, at this juncture, the ethologically minded reader is likely to wonder whether the model will consistently yield suitably adaptive behaviour. Although PEARCE naturally acknowledges the evolutionary origin and history of learning, he is clearly not inclined to deal with the functional connection that must exist between conditioning phenomena and organismal survival.

Ch. 6 considers how knowledge may be translated into action. While some of the arguments concerning the response-eliciting effects of classical and instrumental conditioning are fairly conventional and accepted, the treatment also includes some ideas that are more controversial. Expectancy theory, for example, assumes that animals may sometimes be driven by purposiveness and that propositions may be the means by which this is achieved. Handling of codes like 'I want food, therefore I press the lever' are no longer considered to be beyond a rat in a Skinner-box.

Problem solving and reasoning comes next. Much space is devoted to cognitive maps. In a new edition, a cross-reference to neurophysiological correlates (place neurons; see e.g. FOSTER et al. 1989) should perhaps replace that relating to cognitive maps in bees, which, according to recent evidence, are no longer tenable (compare KIRCHNER & BRAUN 1994). The inclusion of a section on animal navigation (along with some related, humorous newspaper snippets) is a praiseworthy novelty in a psychological textbook. The treatment of insight learning is disappointingly desultory and, moreover, Wolfgang KÖHLER's surname is consistently misspelled. Discrimination learning serves as a somewhat stretched heading for the brief description of its principles and a rag-bag assortment of higher competences such as transitive inference and analogical reasoning.

Ch. 8 deals adequately with the communicative and linguistic behaviour of animals with bees,

pigeons, parrot Alex, dolphins and chimpanzees putting together their now well known shows. The pygmy chimpanzee Kanzi, a brilliant late-comer, does not, however, appear (compare SAVAGE-RUMBAUGH 1993). For me, it was an occasion to turn back to some of the earlier chapters and wonder when it will be possible to write about say, chimpanzee language with the same kind of detached, rigorous formality that PEARCE used when treating associative learning. It will be quite a while, one suspects.

The final chapter returns to the distribution of intelligence among the vertebrates, the theme with which the author had opened the book. Although no major new insights accrue, the revisit furnishes the opportunity to address the so-called null-hypothesis credited to Euan MACPHAIL. This purposively annoying theory maintains that there are no demonstrable differences in intelligence among vertebrates, except humans. Although PEARCE does not believe in the hypothesis, he finds it hard to dispose of neatly. Nevertheless, the theory forces him to bring up again the theory of evolution in a far more differentiated and productive way than he did in the first chapter. Perhaps something like this last section of the book could be the first section in a new edition that author and publisher should soon offer us.

References

- EMMERTON, J. & DELIUS, J. D. 1993: Beyond sensation: visual cognition in pigeons. In: Vision, Brain and Behavior in Birds (ZEIGLER, H. P. & BISCHOF, H.-J., eds). MIT Press, Cambridge. pp. 377—390.
- FOSTER, T. C., CASTRO, C. A. & MCNAUGHTON, B. L. 1989: Spatial selectivity of rat hippocampal neurons: dependence on preparedness for movement. *Science* 244, 1580—1582.
- KIRCHNER, W. H. & BRAUN, U. 1994: Dancing honey bees indicate the location of food sources using path integration rather than cognitive maps. *Anim. Behav.* 48, 1437—1441.
- PEARCE, J. M. 1994: Similarity and discrimination, a selective review and a connectionist model. *Psych. Review* 101, 587—607.
- SAVAGE-RUMBAUGH, E. S. 1993: Language learnability in man, ape, and dolphin. In: Language and Communication: Comparative Perspectives (ROITBLAT, H. L., HERMAN, L. M. & NACHTIGALL, P. E., eds). Erlbaum, Hillsdale. pp. 457—484.