

Autoshaping and Conditioning Theory. Edited by C. M. Locurto, H. S. Terrace & J. Gibbon.
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An apocryphal question put to students of clinical neurology is 'why does a dog wag its tail?': those students who answer in terms of cycles of reciprocal inhibition between bilateral reflexes in the sacral spinal cord fail, the correct answer being 'because it is happy'. A dog accustomed to seeing a light-bulb flash for a few seconds before a meat dispenser operates may go over and fawn around the light, wagging its tail. The currently correct answer to the question of why the dog wags its tail in this instance is 'autoshaping'. This is in some ways an unfortunate term. It was coined initially to describe a particular kind of non-operant behaviour in pigeons, which is interesting because of its anti-Skinnerian implications. Skinner used to rest his entire theoretical position on experimental demonstrations that pigeons do things that gain them food rewards, taking these to imply that positive reinforcement is a good explanation for practically everything. But, in 1968, it was discovered that operant reinforcement has serious inadequacies as an explanation for why pigeons peck keys in Skinner boxes, because this behaviour may be induced by procedures which exclude or minimize the factor of external reward: if a disc is lit as a signal about 10 seconds before the birds' food hopper is presented, then they soon start to peck at the signal key, when it is illuminated, even if it is arranged that this actually prevents a succeeding presentation of food (an 'omission procedure'). This phenomenon has deservedly received much further attention, and Locurto et al. have now put together nine chapters in an attempt to provide an up-to-date assessment of 'the far-ranging impact of autoshaping'. Terrace gives a brief but comprehensive introduction to the subject, and there are three chapters on 'Biological factors', two on 'Associative factors' and another three on 'Temporal factors'.

If 'because of positive reinforcement' is not a complete answer to the question of why pigeons peck keys in Skinner boxes, the other parts of the answer are likely to be biological – pigeons peck things because they are pigeons, just as dogs wag their tails because they are dogs. In other words a major implication is that species differences should be taken seriously by conditioning theorists. Although some lip service is paid to the ideal, the main weakness of this volume is that almost all the data presented are from pigeon experiments. Wasserman, in a chapter on 'Response evocation', discusses species differences, and gives some data on autoshaped responses by chicks to a keylight signalling heat (which include pecking the key). But his 'Comparative-evolutionary analysis' is cursory, and ends with the rather limited conclusion that 'strong sequential dependencies exist between the birds' locomotor, pecking, and intraoral activities that may be strongly influenced by evolutionary as well as developmental organization'. As President Johnson might have put it, pigeons are not prepared to walk and swallow at the same time. Williams asserts that his own chapter 'takes a major step beyond the conventional use of conditioning concepts'. The step turns out to be saying that operant and classical conditioning are processes which can both apply to the same response. No doubt this will indeed 'share productively in the labour of answering the riddles of biologically significant behaviour' but the inspirational tone seems a trifle overdone, given the pedestrian nature of the theoretical advance.

If biological factors are genuinely important, then the division between them and the associative and temporal principles is likely to cause problems. The unifying idea offered by Locurto in his chapter is that the temporal sequence of a signal followed by food establishes an internal association between these events, with responses evoked as a result of the association varying according to species and according to properties of the signal and the goal event. Pigeons direct relatively stereotyped and reflexive responses, which are appropriate to the goal, at localized visual signals, but other species (crows, rats, monkeys) tend to direct any anticipatory behaviour towards the site of the goal rather than towards the signal, and also modulate any anticipatory responses in accordance with operant pay-offs more than pigeons do. In Locurto's words 'a variety of results are observed' when species other than pigeons are studied.

Since this is the case, one would think that people would now hesitate to base general theories of conditioning on what pigeons do in Skinner boxes, but the remaining five chapters disconfirm this expectation. Rashotte says that second-order autoshaping is 'robust', but admits that it has been demonstrated only in pigeons and chicks. A long chapter by Tomie concludes: 'The application of the context-blocking analysis to retardation phenomena observed in transfer designs requires only the absence of a context change and the presence of between-groups differences in context conditioning with the initiation of testing', which sounds like a general theory, although I'm not sure of what.

However, I was intrigued by the last section, on 'Temporal Factors'. Most of conditioning theory is about what happens when stimulus A is followed by stimulus B, and the recent conventional wisdom has been that what matters is not the simple AB sequence, but the effect of A on the conditional probability of B: if the world is full of Bs without preceding As, then one AB conjunction should not produce an association. Sure enough, giving animals Bs (or As) by themselves often reduces the effect of any AB conjunctions. But Jenkins et al. point out that presenting an animal with a lot of Bs changes not only conditional probabilities, but also the absolute frequency of Bs. Not altogether surprisingly, it appears that pigeons are influenced very much more by the absolute frequency of food presentations than by conditional probabilities, when carefully controlled comparisons are made using autoshaping procedures. Jenkins et al. propose that 'Relative Waiting Time' is the crucial variable – a signal is effective because it takes the waiting out of wanting, but there has to have been some waiting in the first place. Gibbon & Balsam concur in the renaissance of simple contiguity: 'It makes very little difference to birds whether alternative signals negatively correlated with food are present or not, or whether times between food presentations are variable or not, or whether the signals predicting food are consistent or inconsistent, provided at least a few signals are contiguous with food presentations' (p. 248).

In the final chapter Gibbon continues the theoretical analysis, finding that his own 'Scalar Expectancy Theory' is indistinguishable from Jenkins' 'Relative Waiting Time' proposal, since both assume that the effectiveness of a signal depends on temporal spacing, and on a contrast between the disappointments of waiting and the delights of anticipation. One might be forgiven for paraphrasing Gibbon's elaborate answer to the question of why pigeons peck keys in Skinner boxes by saying that pigeons have an innate tendency to peck at something that makes them enthusiastically expect something else.

The emphasis on temporal spacing as a factor in associations and expectancies is probably valuable, and may even apply to animals other than the pigeon, although there is no reason to suppose that the timing of emotional states in one species will apply to all others. The number of readers who will share the belief expressed in the preface that the contents of the book are far-ranging is I should think quite small, but this minority will find Locurto et al.'s volume extremely useful.

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