

Animal Models of Human Behavior

**Conceptual, Evolutionary,
and Neurobiological
Perspectives**

Edited by
GRAHAM DAVEY



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Neurobiological Perspectives*

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Graham C. L. Davey
*The City University
London*



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Editor's Preface

In effect, comparative studies of humans and non-human animals commenced only following the Darwinian revolution of the nineteenth century. Prior to this, both academic and religious dogma had strictly enforced the human–animal dichotomy on the basis of intellectual capacity, social achievement, and divine pronunciation. Nevertheless, even today 100 years after Darwin's death, anthropologists, biologists, and psychologists are still unsure about the significance and even the morality of making human–animal comparisons. To the uninformed reader this might imply that little progress has been achieved in our understanding of the biological and psychological relations between animals and humans, but this is to ignore the tortuous history that this topic possesses. Immediately after the publication of Darwin's thesis on the origin of species, and more specifically after the publication of *The Descent of Man* the search began for human traits in non-human animals: even to the extent of attempting to detect such characteristics as inductive reasoning, imagination, aesthetic appreciation, and even religious belief. This endeavor failed, and not only because its adherents were enthusiastic amateurs such as farmers, zoo-keepers, and animal breeders who relied for most of their evidence on anecdotes and casual observations. Their place was taken by the positivists and the experimentalists of the early twentieth century, and the question of human–animal comparisons was turned on its head. Animal experimentalists and later behavioristic psychologists, such as Lloyd Morgan, J. B. Watson, and B. F. Skinner advocated a psychological understanding of the non-human animal as the yardstick for judging and understanding human characteristics. They based their approach on the common important influence of evolutionary factors in determining behavioral and psychological processes in all living organisms, and the need to confine behavioral studies to concepts in keeping with the strictures of scientific experimentation. Both the Darwinian and behaviorist/reductionist approaches have been seen as attempts either to elevate non-human animals to the psychological level of man or to reduce humans to the apparently more mechanistic level of animals, and unfortunately for psychology in general this

polarization has tended to create more heat than light. Arguably, the question is not 'Can we equate the behavioral and psychological processes of humans and animals?' but 'What, if any, is the heuristic value of doing so?'. At the very least the question of *how* animals and humans can be compared has traditionally been a secondary one, and one which has only recently been broached with any commitment.

The present volume is an attempt to illustrate some of the contemporary approaches to the 'How' and 'Why' questions raised by human-animal comparisons in psychology and behavioral biology. Many of the contributors to this book attended a symposium on 'Extrapolation from Animals to Man in Psychology' held at the City University, London, in March 1980. The symposium was convened in the first instance to try and survey some of the many diverse ways in which psychologists were attempting to extrapolate animal findings to human behavior. There were clearly many areas in which psychologists were willing to use extrapolation: learning theory, brain-behavior relationships, sociobiology, psychopathology, to name but a few. What became clearer as the symposium progressed, however, was that there was no clear consensus on *how* we should extrapolate from animals to humans, even though a majority of contributors agreed that extrapolation was a useful exercise from both a practical and heuristic point of view. It is from these considerations that this volume stems. It is not only an attempt to look at the practical benefits of elaborating animal models of human behavior (as in the use of animal models of human psychopathy—Section III), nor just of comparing various psychological processes or mechanisms across animals and man, but—perhaps most importantly—it is an attempt to come to terms with a few of the conceptual problems inherent in extrapolation and to try and piece together the bare bones of a conceptual framework which will provide some answers to the 'How?' question posed by animal-human comparisons.

Whilst compiling the contributions to this book it became clearer to me that there was a framework within which all interspecific comparisons could be made—that of evolutionary biology. Even as specific research workers concerned with process biology, cognitive psychology, or functional analyses of behavior, our findings—and our extrapolations—must conform with the principles of biological evolution, and biological evolution is a process afflicting the whole gamut of living organisms. This is not to say that one must directly attack animal to human extrapolation from a purely evolutionary angle: given that the researcher has comparable analytic techniques for the study of animals and humans (and an evolutionary analysis can help to clarify what might and might not be comparable techniques—see Chapter 12), then we can begin to experimentally compare the various behavioral and psychological mechanisms possessed by animals and humans. A variety of the contributions to this volume express this line of approach (Chapters 4, 5, 6, 12, and 13). However, making interspecific comparisons is not strictly the

same as extrapolation from one species to another. Extrapolation implies that our findings with one species tell us something about a second, different, species, without us necessarily conducting similar rigorous investigations on that second species. Here extrapolation itself is useful in at least two important ways. First, it allows us to understand human psychological processes in circumstances where constructing animal models of those processes is potentially the most rewarding and practical line of approach in the short term. This is particularly true in the case of psychopathology (see Chapters 13, 14, 15, 16, and 17). Secondly, extrapolation allows us to test very general theories of behavior; for instance, sociobiology (see Chapters 9, 10, and 11). The rules for extrapolation, it seems, must in the last analysis be extracted from principles of evolutionary biology. But even here it is not yet obvious how these principles should be interpreted to provide the rules for extrapolation. Some possibilities are outlined in Chapters 7 and 8.

Finally, this volume has trodden a long and tortuous path to reach its present form, but I hope it provides a cross-section of contemporary views on interspecific comparisons in general and animal models of human behavior in particular. The book would not have come to fruition if it had not been for some early conversations with Chris Cullen on the topic of extrapolating from animal to man in psychology, nor if the Nuffield Foundation had not kindly funded the original symposium in 1980; I am grateful to both. I must also acknowledge a long-standing debt to B. F. Skinner. Whilst hesitating to label myself as a 'Skinnerian', it was Skinner's writings that originally aroused my interest in extrapolation from animals to humans and largely contributed to maintaining that interest over the past ten years or so. Last, but not least, my wife Sian deserves an acknowledgment; although she is not aware of the fact yet, she will probably contribute generously to the reading of proofs and compiling of the index. To her I am very grateful in advance.

GRAHAM C. L. DAVEY

London, May 1982

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Section I

Conceptual and Historical Issues

It is clearly important to understand how conceptual and historical factors influence the way we use animal models as aids to explanation of human behavior. The way in which we talk about human behavior in an everyday sense is often quite different from the way in which we talk about animal behavior. As a start we are more willing to use mentalistic and uniquely cognitive concepts to describe the causes of human behavior—if only because we can all individually testify to the existence of our thoughts, feelings, and memories. But as psychologists we are much less willing to use these concepts with animals. For instance, it is only recently that we have acknowledged that animals may have complexly organized memories of the world, and, for instance, possess such attributes as elaborate cognitive maps. Only in the last decade have we really begun to shake off the legacy inherited from the early behaviorists which implored us to interpret the actions of animals in relatively mechanistic terms. Even when animal behaviorists were willing to admit the existence of such things as memories in animals these were the crudest of neural traces. Clearly, one factor that has enabled animal models to become more relevant to human behavior is the willingness of researchers to construct cognitive rather than purely behavioral models of animal behavior. In the 1950s and 1960s extrapolation from animals to man was almost entirely the domain of the Skinnerians, and they conducted extrapolation on the basis of an understanding of behavior at the level of controlling variables (the empirical law of operant reinforcement is an instance of this). However, throughout the 1970s, the Skinnerian analysis was in decline—for a number of reasons. First, an analysis at the level of controlling variables is useful only if the empirical laws evolved from a study of controlling variables exhibit some kind of general consistency. Two branches of evidence began to suggest that many of the Skinnerian laws did not exhibit this consistency: humans

did not appear to learn in the same way as rats or pigeons (see Chapters 5 and 6), and more ethologically orientated behavioral tasks suggested that there were clearly limits to which general behavioral laws could be applied even to animals. The second contribution to the gradual demise of the Skinnerian approach was, I believe, the burgeoning of research in human cognition in the 1970s. This appears to have spurred animal psychologists to develop techniques for investigating uniquely cognitive aspects of non-human behavior. And they have subsequently discovered that, in many cases, a cognitive analysis helps to ameliorate some of the apparent anomalies arising from purely behavioral analyses. Of course, there are those who do not see cognitive analyses as being any improvement over traditional behavior analyses, and some of these arguments are expressed in the first section of this book. However, at the very least, recently evolved cognitive analyses of animal behavior do have the advantage of opening up new avenues of psychological research in animals and, as a consequence, developing models of animal behavior which could have more than just superficial relevance to human behavior.

Chapter 1

Responsibility in the Cockroach: An Exercise in Linguistic Phenomenology

T. R. MILES

1. INTRODUCTION

Lest there should be any misunderstanding I should like to make clear that this is not a chapter describing research into the behavior of cockroaches. I know very little about the cockroach—almost certainly less than most of my audience. I do know, however, that it sounds odd, or uncomfortable, to speak of *responsibility* in the cockroach. In general, there are many expressions which we use without qualms in speaking of human beings but which become progressively more uncomfortable as we attempt to apply them to species of lesser degrees of complexity. The theme of this chapter is that similarities and differences between humans and other organisms are reflected in the ways in which we talk. Careful examination of such talk, therefore, can highlight features in a particular situation which we might otherwise have overlooked. The exercise is one which Austin (1961, p. 130), perhaps with his tongue in his cheek, has called 'linguistic phenomenology'.

In this kind of enquiry it is of course important to distinguish conceptual analysis from conceptual revision (compare Harzem and Miles, 1978). In the case of conceptual analysis one is examining the classifications implicit in language systems as they exist at present; in the case of conceptual revision one is explicitly or implicitly making proposals for change. I shall be concerned in this chapter mostly with the former. Just because we talk as we do about humans and animals it does not of course follow that there are no better ways of talking; but it is arguable that one should try to be clear-headed about existing classifications before one sets out to advocate change.

Before I embark on my main argument three preliminary points require mention. In the first place, despite the pressures to classify *homo sapiens* as

a member of the animal kingdom, in this chapter I shall follow popular practice in using the word 'animal' to mean 'non-human animal'. Secondly, if it makes no sense to speak of 'responsibility' in the case of cockroaches, then it is as inappropriate to say of a cockroach that it was *not* responsible for a particular state of affairs as to say that it *was* responsible; similarly, if it is inappropriate to say of a worm that it recognized me, then it is also inappropriate to say that it failed to recognize me. During much of this chapter I shall be calling attention to expressions where the negative form is as inappropriate as the positive. Thirdly, I shall not be talking about situations where animals are portrayed in fiction. Some of you may remember that Christopher Robin had a beetle called Alexander who

... had a sort of look as if he thought he ought to say
I'm very, very sorry that I tried to run away.

Clearly in fiction, or in a child's imagination, any animal can be endowed with human qualities, and indeed in some stories, for example the Dr Dolittle books, the animals retain in a delightful way their animal characters despite talking and acting like humans. Interesting, however, though such characterization is, I shall not refer to it here.

Many different words are interesting from the point of view of linguistic phenomenology. Those which I shall be considering can conveniently be classified under three main heads, namely (1) words which imply planning and cognitive skills, in particular *want*, *choose*, *intelligent*, *recognize*, *mistake*, *guess*, and *say*, (2) words which are descriptive of *personality*, such as *placid*, *nervous*, *obstinate*, and *wilful*, and (3) words which are closely connected with social institutions, in particular *punishment* and *responsibility*. I shall thus be asking three questions, namely (1) to what extent do we describe the cognitive skills of humans and those of animals in the same terms?, (2) to what extent do we describe their personalities in the same terms?, and (3) to what extent do we describe their social institutions in the same terms? In attempting to answer these three questions I hope to highlight both similarities and differences. I shall end with some brief comments on behaviorism and on Lloyd Morgan's canon.

2. MEN, DOGS, RATS, AND COCKROACHES

2.1. Planning and cognitive skills

I begin with the concept of *wanting*; and for this purpose I shall consider the following four sentences: (a) The man wanted to go into the field, (b) The dog wanted to go into the field, (c) The rat wanted to go into the field, (d) The cockroach wanted to go into the field. It seems to me plain that (a) and (b) are comfortable and that (c) and (d) are uncomfortable. Why should this

be so? It cannot simply be that the man is in a position to put into words what he wants, else how could one say that the dog wanted . . .? I suggest that we would be willing to say of a dog that he wanted to go into a field if we had evidence that he was in some way aware of what was going on in the field (for example if his master were there or even a rabbit), and if his movements, perhaps towards a gate, had the character of being purposeful. Michotte (1963) has made us aware of all kinds of nuances which can be studied experimentally in connection with 'movement towards' and 'movement away from', and in particular he has shown that living movement has certain distinctive features. It seems to me that the presence of the right kind of living movement in the right kind of context could justify the claim that a dog wanted to go into a field; and it is an obvious fact that the same sorts of purposive movement are not made by rats or cockroaches. One cannot envisage them jumping the height of a hedge, seeing their owner and then making for the nearest gate. Similarly one can say that a dog wants a drink, for example if he is panting and looking hopefully in one's direction; in contrast, though a rat or a cockroach—or even a plant—may *need* water they do not pant and look hopefully at people, and I suggest that it is the absence of these kinds of behavior which makes it uncomfortable to use the word 'want'.

It is worth noting that in the above discussion I have referred to the dog as 'he' rather than 'it'. This decision was not made without hesitation since there are pressures in both directions. In contrast the pressures to refer to a rat as 'he' are appreciably smaller and the pressures to refer to a cockroach as 'he' are virtually non-existent. I suspect that we use the personal pronoun in the case of organisms to whom we have given names, for example a pet rabbit as opposed to a wild one.

If we now pass to the concept of *choosing*, the position appears somewhat different. One is almost happy to say of any organism, even the cockroach, that it chose to go down one of two routes, for example the darker of two alleys. Possibly, however, in this context the word 'choose' is doing very little work. Certainly there are situations where we say of a human that 'he had no choice'; but if we exclude situations where previous pressure is brought to bear and consider only those situations where the 'correct' response is rewarded, it is not entirely clear that 'the cockroach chose the darker alley' means any more than that it *went down* the darker alley. Possibly in the case of a very young baby one might feel hesitant in saying that he *chose* the red smartie (in a context where—so it might be said—it is true only that he put out his hand and grabbed the red smartie and not the blue one). There is a possible case for saying that the word 'choose' is applicable only when there is a conscious consideration of consequences or even actual verbalization. However, there is nothing self-contradictory in the expression, 'I chose it without thinking'; and if the existence of alternative

possibilities is the key notion then one need have no hesitation in saying that a cockroach makes choices and certainly none in the case of the young baby. There is in fact a sizeable literature on choice in the pigeon (see, for example, Catania and Sagvolden, 1980), and I see no reason in this context for putting the word 'choice' in inverted commas.

Let us now consider the following four expressions: (a) an intelligent man, (b) an intelligent dog, (c) an intelligent rat, (d) an intelligent cockroach.

It is certainly uncomfortable to speak of an intelligent cockroach; and it must surely be significant that when he studied skill in maze running Tryon (1940) did not speak of 'intelligent' rats but characterized them as 'maze-bright' and 'maze-dull'. Many investigators do indeed speak of 'naive' rats—and mischievously I envisage the rats as making rather simple-minded remarks!—but clearly in this case one is expected to discount many of the ideas which normally accompany the word 'naive'. Dogs can certainly be—or fail to be—intelligent. On the other hand, one does not expect an intelligent dog to do the same kinds of thing as an intelligent human and it would be decidedly uncomfortable to say that one dog had a higher IQ than another dog. The manifestations of intelligence are likely to vary from one species to another. An important point here is that humans, more than animals, perform courses of actions which are interconnected; thus, to adapt an example from Professor Ryle, whistling from *joie de vivre* may be physically indistinguishable from whistling in order to train a puppy but one describes the behavior differently because of the difference in context. If human actions are to be termed meaningful, purposeful, or intelligent they need to be interconnected; and we do in fact speak of an intelligent sheep-dog if he performs certain actions in the right order; and in saying this we are stressing the similarities with correctly ordered behavior in humans.

One may, of course, be tempted to say of the sheep-dog, 'It was not intelligence but instinct which made him do it'. Now part of what is meant by attributing behavior to instinct is that certain relatively simple mechanisms are involved; and, consequently, if behavior is to be termed intelligent as opposed to instinctive, certain predictions follow as to what *other* behavior can and cannot be expected. For example, if nest-building in birds were a manifestation of intelligence, this entails an ability to adapt to new situations which birds do not in fact possess. It is interesting that 'instinctive' is sometimes loosely used to imply behavior that is carried out without conscious thought, as in expressions such as 'his fingers instinctively grasped the trigger'. It is no doubt the degree of adaptability which a trained sheep-dog can show that leads us to describe his behavior as 'intelligent'; he adjusts to new circumstances in ways in which birds, spiders, and sticklebacks do not.

With regard to recognition, one can say of a dog that he recognized or failed to recognize someone, but there are at least twinges of discomfort in using the word 'recognize' of the behavior of a rat or a cockroach. It is not

obvious why this should be so, but the following consideration is perhaps relevant: to recognize a person, animal, or object is not merely to be able to respond differentially when that person, animal, or object is present but to be able to emit a *series* of correct responses, as when a dog wags his tail when his master appears and then fetches his master's walking stick! We are hesitant, I think, to say of a rat which had jumped correctly from a Lashley jumping-stand that it *recognized* the difference between triangles and circles, since no appreciable *series* of behaviors was involved; and if a rat or a cockroach were to respond differentially to its mate we would still hesitate to use the word 'recognize' unless there was a series of behaviors which occurred involving adaptability to fresh circumstances. This is an area where familiar expressions such as 'recognize' and 'possess the concept of' are best avoided, since they do not specify what happened with sufficient accuracy.

The making of *mistakes* is, I believe, largely though not exclusively a characteristic of humans. An obvious example of a mistake is the situation where one intends to do or say X but ends up by doing or saying Y, and it is very doubtful if one could say even of a dog—let alone of a rat or cockroach—that he made that kind of mistake. There may, however, be situations where without conscious intent an organism adopts a sequence of behaviors, and in these situations any performance involving the wrong sequence could without too much discomfort be termed a mistake. A chimpanzee might well make a mistake in his efforts to earn tokens.

Guessing is a term which seems to me applicable only to humans. The contrast, I take it, is between those situations where a person acts out of knowledge or at any rate out of fairly well assured belief and those situations where he acts with minimal or no grounds for foreseeing the outcome. Thus I may guess—rightly or wrongly—that my opponent at bridge holds the king of spades, but it is no longer a guess if I deduce this on the basis of evidence and still less if I am unscrupulous enough to peep into his hand! In contrast it is difficult to think of situations where animals succeed or fail in comparable deductions, and one therefore has no occasion to use the word 'guess', since this implies *absence* of such deduction, which in its turn implies the possibility of its *presence*. Only an organism which possesses the capacity to act from knowledge can guess or fail to guess.

I now pass to the concept of *saying*. Uttering words or writing them is the usual way of saying things, but it is possible to say things without using words and it is possible to use words without saying anything. Thus a look in a person's eye may, as we say, 'speak volumes', and some of you may remember the florists' advertisement of many years ago, 'Say it with flowers!' Equally, one may ask of an obscure lecturer, 'But what did he really *say*?' Talking does not imply saying, and the expression in Greek, *ouden legein* (literally 'to say nothing') often means 'talk nonsense' rather than 'remain