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Comparative Psychology

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Preface

THE increasing number of courses offered in Comparative Psychology gives some indication of the importance of the subject. Realizing the need for a satisfactory textbook in this field, a number of men who had been working in Animal Psychology convened at the Cornell meeting of the American Psychological Association and planned an introductory textbook. Each of them prepared independently a suggestive outline for the book as a whole. After studying this outline, a committee selected what appeared to be the most important topics and allocated the assignments among the men according to their specializations. Thereafter each contributor developed his topic in his own way and assumed full responsibility for content, for interpretation of data, and for placement of emphasis. The book is thoroughly documented, so that anyone wishing to go back to the original sources will have no difficulty in so doing.

The editor wishes to commend the contributors for their systematic team work in attempting to reduce or eliminate needless repetition of closely related subject matter. Perhaps still more along this line, as well as along the line of unification, could have been done had not the time and transport factors rendered personal consultations among the contributors impossible. There was no effort whatever to curb or to eliminate diverse opinions on controversial subjects; such opinions are omnipresent in rapidly changing subjects, and no student is any the worse for encountering them in his reading at the very outset.

Through coöperative efforts, singularly free from the secretive reserve sometimes found among specialists, a book

more representative of Comparative Psychology as it is to-day has been obtained than could reasonably be expected from the hand of a single contributor in this varied and ever-expanding field. Breadth of view and wealth of subject matter more than compensate for a certain lack of unification inevitably present in a work of this kind.

Washington, D. C.
May, 1934.

F. A. Moss
Editor

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CHAPTER I

Why Study Animal Psychology?

EDWARD L. THORNDIKE

Columbia University

WE may study animals' minds because of scientific curiosity to know what they are and how they work. We may study them because we wish to avoid trouble and to gain efficiency in trapping or killing wild animals or in breeding and raising wild or domestic animals or in using animals as pets or workers. We may study them in order to understand the minds of human beings better or to manage human beings better. For whatever reason we study them, the knowledge and insight gained are likely to increase and refine our knowledge of human nature and our control over it. Man is a vertebrate, a mammal, and a primate, as well as *homo sapiens*. Better knowledge of the behavior of even the lower vertebrates such as fishes and amphibians may lead to better knowledge of the behavior of man. Better knowledge of the behavior of our nearest relatives, the primates, is more likely to do so.

A human mind is the product of original unlearned tendencies and the experiences of life. The former, man possesses as parts of his human inheritance, just as he possesses a backbone, erect stature, small fore-limbs, and a large brain. The latter act upon his mind to change it in accordance with the laws of human modifiability. The original tendencies of man are better known with the aid of knowledge of the original tendencies of our animal rela-

tives; and the laws of human modifiability are better understood through understanding animal learning.

The early psychologists tended to describe each of man's original tendencies or instincts merely as an ability to attain such and such a state or as a proclivity toward such and such a condition. So we were told about the instinct of self-preservation, or the mating instinct. The study of animal instincts encourages, or even requires, us to do more than name the fact that certain states and conditions are more or less attained or favored. For example, the "constructive instinct" so obviously consists of different sets of responses to different sets of conditions in bees, birds, beavers and chimpanzees that we must ask concerning the "constructive instinct" in man, "Just what responses occur, to what external situations, and with the coöperation of what internal circumstances, contexts, or sets of mind?"

The separation of what is instinctive or unlearned from what is added by experience is often easier to make in animals than in man. Thus, a rat's sex-activity may easily be kept free, from birth to adulthood, from all other forces save its inner development and such stimuli as the observer chooses; but no human child's probably ever has been, nor could it be, save at great cost. Indeed, the instinctive tendencies that lead to mating and the influence of experience upon them are perhaps better known in the case of the white rat than in the case of man, in spite of the fact that the former have been the subject of observation by only a few persons for a few hundred hours.

The dates of appearance of original tendencies, their general development, and their waning are conveniently studied in animals. The fighting of chickens can be observed from its first beginnings, where two chicks a few days old confront one another for a second or so and then go about their other business, to the full-fledged cockfight.

Naturalists used to think of an instinct as a power producing a certain response to a certain situation more or less

inevitably and uniformly. Partly as a result of animal experimentation, any such tendency is now thought of as increasing the probability of the response in question, but not necessarily or always to 1.00. Fear of the dark may mean, not that the creature is always or usually afraid when confronted by darkness, but that he is then more likely to be afraid. Darkness plus loneliness may give higher probabilities of fear than either alone. In general, behavior at any moment is a consequence of all the tendencies and fragments of tendencies acting at that moment.

With animals, the development of tendencies can be studied long before birth, by keeping the embryo alive in a medium comparable to that provided by its mother, and subjecting it to various situations. This has been done by Carmichael and his pupils with most interesting results.

The general and fundamental facts of human modifiability are often complicated by the enormous number of modifications that are already made. If you study your learning of French, you need to make allowance for what you know of English and other languages. If you study your likes or your dislikes for new foods, books, or music, you need to measure forces produced by what you have eaten, read, or heard in the past and by the behavior of others toward your past acts and toward foods, books, or music, and to some extent by whatever else happened along with your past experiences. Much of this work is avoided when we study animals. Indeed, it would be possible to observe almost the entire life of an animal so as to have the data whereby to explain nearly all its past and predict nearly all its future.

A generation ago the study of the human mind had described powers and processes such as abstraction, generalization, judgment, reasoning, choice, desire, motives, purposes, attention, the association of ideas, fusion, habit, and automatization; but it had made little progress in working out the dynamics by which these functions operate to make

men think and act and learn. Since then, experiments with human subjects have led to simpler and more fruitful accounts of the causation of human behavior, but the simplest and perhaps the most fruitful have come from the study of animal learning. The formation of mental connections by varied reaction and the strengthening of one of the variants (the so-called animal learning by "trial and error" or "trial and success") has been found at the base of much of human learning. So also has the process of associative shifting whereby a response first connected with a total, say *ABCDE*, is later aroused by *BCDE*, or *CDE*, or *DE*, or *E* alone. It is not important to decide whether more gain has come from using simple general principles found in animal learning to explain the complex and subtle forms of human learning than from studying the latter alone. The former has surely been useful.

Besides providing general principles that may be adequate to account for much, or even all, of human learning, experiments with animals enable psychologists to test hypotheses of all sorts so far as these hypotheses do not involve the action of ideas and impulses that are limited to man. For example, students of general and educational psychology found reason to believe that the same total amount of practice was more beneficial when distributed in decreasing amounts with increasing intervals of time between the doses, than when taken in a few large equal doses near together. Tests of this and other ways of distributing practice with animals have been made with much profit. To obtain facts concerning the relative ability of man to learn at various ages from the same individuals at different ages has been impracticable, and it has been hard to keep such facts free from selective influences when different individuals were used. Check experiments were made upon rats at much less cost of time and labor. Certain experiments with human subjects suggested to the writer that attaching a reward to a mental connection invariably

strengthened it but that attaching a punishment to a mental connection did not in and of itself weaken the connection, but did so only when and as it caused the person to form some alternative connection. He then tested this hypothesis in two ways, first by making a wide variety of experiments with human and animal subjects, and second by analyzing the experiments in which punishment had been attached to connections. The great majority of these experiments had been with animals.

Dr. L. S. Hollingworth has suggested that theories of the causation of neuroses, hysteria, and perhaps certain forms of insanity should be tested by experiments with animals. It surely would be prudent to test such doctrines as that neuroses, hysterias, and the like are due to sex perversions or restraints or psychic shocks by setting up these alleged causes in animals and observing the results in comparison with those in a controlled group. Animals perhaps do not have sufficiently complicated minds to become insane in the ways known among men, but it might be well worth while to apply to them the causes that have been alleged to produce insanities in man. According to a doctrine now popular with psychiatrists and some psychologists, the fundamentals of character and temperament and adjustability to the world are due to the experiences of infancy. Evidence to prove or disprove this theory is very scanty, because in man it is difficult to find good experiences with bad heredity and exceedingly difficult to find bad experiences with good heredity. With certain animals we can provide foster parents of any sort within the range of variation of the species or even robot parents outdoing nature's worst.

A number of problems in the social sciences require for solution knowledge of the relative variability of males and females in the human species. It appears to be a fact that by original nature the ablest and the least able, the best and the worst, the sanest and the most insane are predominantly males. But the truth of this conclusion has been disputed

and probably will be until, by nature or by artifice, males and females are somewhere given equivalent training. A fair comparison can, however, be made at any time with the males and females of many other species of mammals.

The problems concerning mental inheritance in man are made difficult by the small number of children of the same parents, and by the fact that inheritance is confused and distorted by family training. Most of these problems should be worked out first in the lower animals, among which we can easily collect a score of brothers and sisters for study, and the training of which can be controlled by the experimenter.

The study of animals not only supplements human psychology and helps to solve problems arising therein: it also suggests new problems and new methods for human psychology. If one were to choose the half dozen discoveries of recent years that have most influenced human psychology, Pavlov's discovery that the act in dogs of secreting saliva could be attached to any stimulus would surely be included. The most hopeful methods of measuring motives and of balancing one desire or motive against another were developed by Moss, Warden, and others in the study of the relative strength in the white rat of hunger, sex desire, and the desire of the mother to reach and attend to her young.

Certain important aspects of human nature such as are covered by the psychology of language, music, science, and business have received enlightenment from the study of animals only indirectly, through better knowledge of general principles. The special sense-powers and motor skills and organizations of ideas of man also are usually best studied directly in him. Not everything in man is enough better understood by knowing its development in the animal kingdom to justify its study in the animals, and the development in the animal kingdom of some traits of the human mind probably never can be known. Man's ancestors parted