Johnson, Jr., R. W. Goy, and K. M. Michels; "Behavioural pharmacology," by S. Ross and C. J. Carr; and "Techniques of measurement and evaluation," by V. H. Denenberg and E. M. Banks. Part 3 consists of seven chapters: "The behaviour of cattle," by E. S. E. Hafez and M. W. Schein; "The behaviour of sheep and goats," by E. S. E. Hafez and J. P. Scott; "The behaviour of swine," by E. S. E. Hafez, L. J. Sumption, and J. S. Jakway; "The behaviour of horses," by E. S. E. Hafez, M. Williams, and S. Wierzbowski; "The behaviour of rabbits," by A. N. Worden and J. S. Leahy; "The behaviour of dogs," by J. L. Fuller and E. M. DuBuis; and "The behaviour of cats," by J. S. Rosenblatt and T. C. Schneirla. Part 4, Behaviour of Birds, consists of three chapters: "The behaviour of chickens," by A. M. Guhl; "The behaviour of turkeys," by E. B. Hale and M. W. Schein; and "The behaviour of ducks," by E. N. Collias. The epilogue, Comparative Behaviour, was written by E. B. Hale.

In the foreword W. C. Young appropriately states that this book is timely because many research workers in many disciplines, notably psychologists, physiologists, ethologists, and ecologists, are probing into the physiology, structure, and behavior of man and other animals. The domestic birds and mammals—carnivorous, herbivorous, and omnivorous—present a much wider range of experimental materials than the usual laboratory animals. There is a great deal of information gained from observation and experience and a rapidly increasing mass of material from experiments on the domestic animals. This book presents both.

Hale, in the epilogue, defines two constellations of behavior pattern in mammals. One pattern includes polytocous reproduction, altricial development, sexual monomorphism, nocturnal habits, and extensive play. (The rabbit is exceptional since it belongs in this group but is an herbivore.) At the other extreme is found herbivorous diet, monotocous reproduction, precocial development, sexual dimorphism, promiscuous sexual behavior, diurnal habits, and limited play.

Birds have similar convergent trends in behavior. Herbivorous diet, precocial development, sexual dimorphism, promiscuous sexual behavior, and diurnal habits tend to be associated. Among both birds and mammals with this array of traits, "peck-right" dominance tends to be established, while altricial birds and mammals tend to be territorial.

In general, domestic species provide excellent material for quantitative studies of behavior, but standardized conditions necessary for cross-species comparisons have not been established.

Ancient lore substantiated and quantified through recent experiment is illustrated by the mother-young relationship. Shepherds have known for centuries that a lamb separated from its mother at birth may not be accepted by her when it is returned after a few hours. Nor will ewes readily accept foster young. Hafez and Scott (chapter 11, p. 320) discuss the relevant research in which Collias demonstrated that following a separation which lasted for an hour after birth lambs would be accepted but that some were rejected following a two-hour separation. Collias also found that he could exchange new borns from different mothers but that this could be done only immediately after birth. Goats are a bit less attached to one another and to the flock. Hafez and Scott note that in a mixed flock the goats are likely to move sooner than the sheep in responding to a disturbance and that the sheep follow the goats. They note that the old practice of using a "Judas Goat" to lead lambs to slaughter in stockyards is in keeping with this behavior.

Behavioral science is in the adolescent phase. Adolescent science, like adolescent children, is exciting in its promise, disturbing in its implication, and occasionally awkward and fumbling. This book contains material that provides a still half-spun web connecting the ancient art of animal husbandry with the emerging behavioral sciences. It provides an insecure link between genetics and behavior. It carries implications for human behavior which are based on demonstrated effects of imprinting of neonatal animals on their subsequent behavior and on demonstrated genetic and physiological bases for social dominance in animal communities.

The book contains some thought-provoking statements—for example, in chapter 3 (by Fuller), "The genetics of behaviour": on page 67, "It is probable that dominance in genetically heterogeneous populations is in part determined by heredity"; but, on page 68, "Perhaps we can fairly state that there is, as yet, no good evidence in animals for a general factor of intelligence which operates in all learning situations."

The contributors to this volume are and may continue to be significant contributors to behavioral science. Behavioral research with domestic animals is important in its potential to contribute new knowledge of general significance. It is especially important to the better understanding of these animals and of their roles in work and in the production of meat, milk, eggs, wool, and other essential animal products, including the companionship they provide as pets.

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Note

Historical Chronology

William D. Stahlman and Owen Gingerich have served all who are interested in precise historical chronology by compiling and publishing these fine longitudinal tables for the sun and the planets—**Solar and Planetary Longitudes: For Years −2500 to +2000, by 10-Day Intervals** (University of Wisconsin Press, Madison, 1963. 596 pp. Paper, $10).

The tables cover the Julian calendar from the years −2500 to +1700 and the Gregorian calendar for the period from +1582 to +2000. Scholars who are anxious to establish the date of an event by referring to planetary positions that may be contained in a historical document must, as Stahlman remarked in his lucid introductory statement, "use the existing astronomical tables essentially in reverse in such a manner as to find an historically plausible date on which the planets were in fact in the given positions." This is usually a complicated task that is beyond the purpose of the chronological problem itself, though necessary to its proper solution, and often it is beyond the capacities of those interested in determining a particular date. The present tables avoid this complexity and add another analytical weapon to the armory of historical scholarship. It is a measure of the nature of learning in our time that production of the table was made possible through the work of a historian, an astronomer, and the IBM-7090 computer at the Smithsonian Astrophysical Observatory.

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