Name: Billie Carden Byers Date of Degree: May 23, 1965

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Synopsis of Material: This report is an introduction to the study of animal behavior for a high school biology class. The areas of the science which were mentioned were those which would be of interest, provide stimulation for the imagination, and arouse curosity in the high school student. The different kinds of behavior are discussed, and examples of animals which exhibit each type of behavior are mentioned. A discussion of the stimulus and the stimulus-response theory is included, and mention is made of how animals depend upon some type of stimulation for their very existance, whether it be an external or an internal stimulus. The social orders or societies are described by representative example using the honey bee society, the chicken hierarchy, and monkey groups.

ADVISOR'S APPROVAL L. Herbert Bruneau

ANIMAL BEHAVIOR, PRESENTED AS A UNIT FOR AN ADVANCED HIGH SCHOOL BIOLOGY COURSE

By

BILLIE CARDEN BYERS

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Report Approved:

L. Hubert Brunea

Report Advisor

Dean of the Graduate School

PREFACE

The high school general biology course is, of necessity, a very general course, indeed. Many areas of study that are encountered by a student after he enters college are only mentioned, or vaguely touched upon, in his general high school biology course. Fields of Entomology, Microbiology, Genetics, Parasitology, Ecology, Embryology, Ethology, Conservation, Forestry, etc. should be introduced as a field of work and study before a student reaches the college level.

A survey course which would serve as an introduction to each of these areas is needed. In a nine month school year all or most of these areas could be presented in an introductory manner and in a shortened form to serve as a means of acquainting the high school student with courses and areas that will be encountered by those planning to enter fields of medicine, agriculture, conservation, research, education, or whatever, and create interest in these areas so as to bring more and better prepared students into the area of the biological sciences.

Due to the scope of this type of report, this paper will be a preparation of only one of these areas. A preparation of this sort for each of the above mentioned areas would comprise a course to be offered in high schools as an advanced or second unit biology course.

This paper is not intended to cover all the areas of ethological study, but is intended instead to provide an introduction of the area to a young mind. The areas chosen were those which would be of the

most interest, stimulate the imagination, and arouse a curosity in the high school student.

The specific animals mentioned in the context were for the most part, those which are readily available to a high school student for observation. Whenever possible the examples were fish, as they can be kept right in the classroom and be readily observable.

The primary aim of this type of synopsis course is to inform the high school student that such areas of study and work exist, and to cultivate his interest so that he will want to follow them up when he goes on to college.

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CHAPTER I

INTRODUCTION

Ethology, or the study of animal behavior, is concerned with five basic factors. The first of these is description, that is, to accurately observe and describe the behavior of an animal. Secondly, the ethologist is concerned with the causation of behavior, whether this be from an obvious, observable stimulation or whether it be some internal stimulation which causes changes to occur within the animal. Thirdly, an ethologist tries to determine the function of a particular behavior, or the purpose the particular behavior will serve for the animal. Fourthly, it is important for the student of animal behavior to learn the biological significance of a particular behavior. Territorality is a good example of this in that the breeding grounds of birds which are set up by a particularly aggressive fighting behavior of the male birds have a definite biological significance in so much as it removes any competition for food, removes enemies of the young, and etc. The final concern is of the evolution of behavior. Ethologists find that through time, behavior as well as morphological structures change.

Each species of animal has characteristic ways of performing certain functions and rarely departs from them. A behavior pattern is an organized segment of behavior having a special function. Its nature is determined chiefly by heredity, but it can also be modified by training and learning.

CHAPTER II

KINDS OF BEHAVIOR

Maintenance Behavior

Maintenance behavior is all of the general and special activities that serve to maintain the animal vegetatively. Feeding and drinking or ingestive behavior, comfort movements, shelter seeking, and eliminative behavior are all forms of maintenance behavior.

Feeding and drinking, or ingestive behavior, is a universal and necessary activity for all forms of animal life and has probably been more thoroughly studied in more species of animals than any other type of behavior. Each animal assumes a definite feeding pattern. Fish will be used as examples throughout because they are easy to maintain in the laboratory and are therefore readily observable. Observable in a well stocked laboratory aquarium are those fish with a primitive mouth, with their fixed jaw and filter feeding apparatus in the mouth; and those with a predatory mouth, where the mouth moves out to catch prey.

Comfort movements or body care movements are especially present in higher animal groups. The disuse of a body part causes discomfort and the resulting behavior is stretching or yawning.

Contact with irritating foreign substances will result in scratching in the mammals, chafing in the fish, and preening in birds. Social grooming behavior in monkeys occurs when they pick parasites off one another.

The tendency to seek out optimum environmental conditions and to avoid dangerous and injurious ones is found in almost all animals and may be called shelter-seeking. (Scott, 1958). This adaptation is seen when blackbirds come to roost at night. They prefer trees which have thickened foliage and branches, permitting the birds to roost close together in a protected spot. The kind of shelter needed and used depends on the type of environment to which the original wild species was adapted.

The behavior surrounding the activity of discarding the body wastes is known as eliminative behavior. The occurrence of this type of behavior is of little importance in the common birds and herbivorous mammals. Dogs and cats whose ancestors lived in lairs, show elaborate patterns of behavior connected with elimination. Cats bury feces and urine, whereas dogs have a tendency to deposit them at particular spots known as scent posts. (Hafez, 1962).

Flight or Withdrawal Behavior

This type of behavior usually occurs in the social context where there are at least two animals, but usually more, present. Animals flee from an unknown situation, from an adverse environment, or from a predator.

Social Behavior

Social behavior is the relationship between animals of the same species. The six types of possible relationships are male and male, female and female, male and female, male and young, female and young, and young and young. Agonistic behavior, sexual behavior, care-giving

behavior, care-soliciting behavior, imitation or contagious behavior, and leadership behavior are all forms of social behavior.

Agonistic behavior can take the form of attack, flight, or conflict. Different species show attack in different ways and use different weapons. Dogs bite each other, as do gulls, and various fish. Horses and many other hoofed animals try to kick each other with the forelegs. Deer measure their strength by pushing against each other with their antlers. Many fish fight by means of vigorous sideways tail-beats. It is relatively rare to see two animals actually engaged in mortal combat and wounding each other. Most fights take the form of bluff or threat. The effect of the threat is much the same as that of actual fighting. It tends to space individuals out because they mutually repel each other. In most species it is the males that fight and they attack exclusively, or mainly, the other males of the same species. (Tinbergen, 1953).

When an animal is attacked it may chose to attack or to flee. Sometimes the desire to attack and the desire to flee are in equal balance and a situation of conflict is said to exist. Conflict behavior can result in three different forms of behavior.

One type of conflict behavior is called ambivalence. This is readily observable in the aquarium when two male fish face off with each other and both are in a state of conflict. They will go into a see-saw like motion with one moving forward and the other backward and then the directions will be reversed. Ambivalence is the inability to attack or flee so the net result is that the animal does some of both.

Redirection might also be observed as a form of conflict behavior. When an animal is in a state of conflict it may direct its attack at some other animal, usually one that is smaller and less likely to fight.

The most curious of the conflict behaviors is the one of displacement. Displacement occurs when an animal behaves in a manner which is completely out of context for the given set of circumstances. In the case of the three-spined stickleback, Gasterosteus aculeatus, if an intruding male arrives at the boundary of a territory, the occupying male will advance to meet him, to prevent further intrusion. The two face each other across the boundary. In each fish there has mounted up an urge to attack; at the same time there arises an urge to flee. These conflicting accumulations of energy are displaced in another quite irrelevant action, often taking the form of symbolic nest digging. The energy is being released along the channel of the next most important instinct at that time, the instinct to build a nest. (Burton, 1953). The thwarted attack and escape drives, whose motor patterns are antagonistic and cannot occur together, find an outlet through this movement. Other species behave similarly during boundary conflicts such as starlings and cranes preening their plumage, tits show feeding movements, and some shore birds even assume the sleep posture.

Sexual behavior includes the courtship, coition, and any related behavior. In fish the courtship phase is made up of a number of signal movements which serve directly as a sort of language or means of communication. The signal movements included are the lateral display, frontal display, fin tugging, mouth fighting, butting, the adoption of an attitude of inferiority or an appeasement posture, and inviting movements. In all of these, certain ways in which the fins are held indicate the mood of a particular fish.

Once a male and female have paired, but not mated, their behavior tends to follow a stereotyped pattern, that is, one action follows

another like the links in a chain, with response and counter response following in a pattern that is the same for all the pairs of a species. If anything happens to break the chain the courtship is likely to be unsuccessful, and the partners must either start all over again, or separate. Even when a fish is at the height of breeding condition, in full colors and actively displaying, a sudden change in the surroundings, will cause it to lose its sense of territoriality, as well as its breeding colors. When the unsatisfactory conditions are repaired, the fish will return to and reoccupy its territory, erect its fins, put on breeding colors and strut with all the air of self-importance.

The male stickleback, Gasterosteus aculeatus, in his full sexual markings has its undersides a bright vermilion red and its eyes, blue. In the first stage of courtship the male zigzags toward the female. The female then swims toward him with her head up. The abdomen of the female bulges with from 50 to 100 eggs. The male swims toward the nest he has built and makes a series of thrusts into it with his snout. He also turns on his side and raises his dorsal spines toward the female. The female swims into the nest and the male prods the base of her tail and causes her to lay eggs. When the female leaves the nest, the male enters and fertilizes the eggs. The male then fans water over the eggs to enrich their oxygen supply. (Tinbergen, 1952).

Care-giving behavior necessarily follows as a consequence of sexual behavior. The young are at first unable to take care of themselves. This care is given by the parents, and begins in many species long before the eggs hatch. The details of this behavior are particularly clearly developed in the jewel fish, Hemichromis bimaculatus, one of the most beautiful of all cichlids. The iridescent, brilliant

blue spots on the red dorsal fin play a special role when the female jewel fish is putting her young to bed. She jerks her fin rapidly up and down making the jewels flash like a heliograph. At this, the young congregate under the mother and obediently descend into the nesting hole. The father, in the meantime, searches the whole area for stragglers. He does not coax them along but simply inhales them into his roomy mouth, swims to the nest and blows them into the hollow. The baby sinks at once heavily to the bottom and remains lying there. The following account by Konrad Lorenz (1952) is the epitome of care-giving behavior in fishes.

> I once saw a jewel fish, during an evening of transporting of strayed children, perform a deed which absolutely astonished me. It was already dusk and I wished hurriedly to feed a few fishes which had not received anything to eat that day. Amongst them was a pair of jewel fishes who were tending their young. As I approached the container, I saw that most of the young were already in the nesting hollow over which the mother was hovering. She refused to come for the food when I threw pieces of earthworm into the tank. The father, however, who, in great excitement, was dashing backwards and forwards searching for young, allowed himself to be diverted from his duty by a nice hind-end of earthworm. He swam up and seized the worm but, owing to its size was unable to swallow it. As he was in the act of chewing this mouthful, he saw a baby fish swimming by itself across the tank; he started as though stung, raced after the baby and took it into his already filled mouth. It was a thrilling moment. The fish had in its mouth two different things of which one must go into the stomach and the other the nest. What would he do? I must confess that, at that moment, I would not have given two pence for the life of that tiny jewel fish. But wonderful what really happened! What a truly remarkable thing that a fish can find itself in a genuine conflicting situation and, in this case, behave exactly as a human being would; that is to say, blocked in all directions, and can go neither forward nor backward. For many seconds the father jewel fish stood riveted. One could almost see how his feelings were working. Then he solved the conflict in a way for which one was bound to feel admiration: he spat out the whole contents of his mouth; the worm fell to the bottom, and the little jewel fish, becoming heavy, did the same. Then the father turned resolutely to the worm and ate it up, without haste but all the time with one eye on the child which "obediently" lay on the

> bottom beneath him. When he had finished, he inhaled the baby and carried it home to its mother. Some of my students, who had witnessed the whole scene, started as one man to applaud.

After young birds are hatched, they begin to show some of the things which are not characteristic of adults, that is, making cheeping noises and holding their heads up in the air with gaping beaks. This behavior consists essentially of calling for care and attention. It might be called infantile behavior except that in other species it is frequently found in animals which are completely adult but are incapable of adjusting or adapting, and substitutes for adaptation a call or signal which may result in care and attention from another animal, thus, the term care-soliciting behavior is used.

Another form of social behavior is imitation or contagious behavior. Birds show a strong tendency to fly together in flocks with an integrated movement. The V-shaped flight of geese is typical of this type of behavior. The long axis of the flock is at right angles to the direction of movement, so that the flock itself is roughly shaped like a great bird. As each bird flies along it does the same thing as those on either side. Buffalo do the same sort of thing as the herd moves from one grazing ground to another, and so do schools of fish. This type of behavior is strongly affected by sensory capacities, since the animals concerned must be able to keep track of and follow each other's movements, sometimes at a considerable distance. Consequently imitation behavior is seldom found in invertebrates. Two exceptions to this are the squids, which have highly developed eyes and swim around in schools like fish, and the army ants, which move in columns by literally keeping in touch with each other with their antennae.

The final form of social behavior is leadership behavior. This is

not to be confused with dominance, where an individual forces his will upon an individual or group, but is instead just what the name implies, leadership. The behavior is found in a flock of sheep where the old female with the largest number of descendants consistently leads the flock. Wild herds of the red deer of Scotland show the same tendency for the older females to lead and the rest to follow. There are very few authentic cases of consistent leadership in other species, in spite of folklore to the contrary. Leadership develops in flocks of ducks and some sort of leadership may exist in herds of wild horses. (Scott, 1958).

CHAPTER III

THE STIMULUS

Behavior, which is called a response, always has some sort of cause which precedes it. This is known as the Stimulus-Response Theory and may be abbreviated as S-R theory. The stimulus may be inside the animal or outside it, or it may be a change in the physical or social environment, but it is always there. Therefore the study of stimulation is an important part of the study of behavior.

The idea of stimulation leads to a study of the causes of behavior. External stimuli enter the body through the sense organs, and we immediately find that animals differ widely in their sensory capacities and their effect on behavior. When we attempt to follow the pathways of nervous stimulation still farther within the body, we discover that they are connected to a whole network of internal physiological reactions, some of which may themselves act as stimuli.

The English ornithologist David Lack (1943) has described a series of experiments on the nature of the stimulus which causes the English robin to fight. He mounted a stuffed robin on a branch near some wild birds, which were building nests. They began to attack it, and deserted their nests as a result. The stuffed robin stimulated fighting even more successfully at the time when the young nestlings were just beginning to grow their feathers. The parent birds would leave the nest to attack the model, but they did not desert their young.

Lack tried to find out what it was about the stuffed robin that

stimulated fighting. He began taking parts of it away and finally ended up with a bundle of red feathers above and white feathers below. The wild robins were being stimulated by only a small part of the model, the color. The shape and position evidently had no effect as a stimulator.

Shortly after a baby chick emerges from the shell, it begins to peck at various objects. Some of these may be grains of food, but the chick may also peck at grains of sand or the eyes of other chicks. The behavior can be elicited by a large variety of stimuli which have in common only their relatively small size. A few days later the chick no longer pecks at inedible objects but prefers food, and as it grows older it can be taught to distinguish between colored grains of corn, one color being glued to the floor and the other being loose and easily eaten. (Scott, 1958).

A newly hatched thrush can be stimulated to open its beak by various means. In the natural situation the mother arrives on the nest, the birds open their beaks, and she sticks food inside. Before their eyes open, the young thrushes react as soon as the nest shakes. Later, when their eyes open, the sight of a moving object nearby will produce the same effect. A stick or the human finger will work as well as the parent bird, but it must move, have some appreciable thickness, and be above the eye level of the nestlings. Anything vaguely approximating the movement of the mother bird's head will act as a sufficient stimulus. (Tinbergen, 1951).

A much more specific stimulus is found in young herring gulls. When the mother returns to the nest and puts her head down toward the young, they peck at her bill in a food-begging reaction. Tinbergen

tested the young gulls with model heads. It is possible to release the begging response of a newly born inexperienced chick by presenting it with a flat cardboard model of the parent's head. The chick responds to this just as well as to the real head. The bill tip of the adult Herring Gull bears a red color patch which stands out quite conspicuously against the yellow background of the bill itself. When this red patch is absent in a model, the chick will respond much less vigorously than to the normal model with the red patch. When these two models were presented in turn to a number of chicks, the average number of responses to the model without a red patch was only one-fourth of that to the normal model. Models in which there was a patch, but of a color other than red, released intermediate numbers of responses. This depended on the degree of contrast between the patch and the bill color. Upon further investigation Tinbergen found that the color of the bill, the color of the head, the shape of the head, or even the absence of the head had no effect on the number of responses. When the chicks are hungry, there is just one thing to them that matters, and that is the parent's bill with the red tip. In addition, the bill must be thin and elongate, it must point down, it must be as near the chick as possible, and as low as possible. These are the only stimuli that are important to the chick; everything else is irrelevant. (Tinbergen, 1960).

In many animals, just like in the gull chick, they respond only to a few selected stimuli. The fighting of the Robin is released by the red breast more than by any other bodily character. The male stickleback's fighting is released by the red underside more than by anything else. It seems as if colors, shapes, calls, and movements have but one function: the release of fighting responses. This idea was first clearly put

forward by Lorenz (1935) who pointed out that social responses are often released by such features, which seemed to be specially adapted to this function. He called such stimuli, releasers.

CHAPTER IV

SOCIAL ORDERS OR SOCIETIES

The Honey Bee

The social society of the honey bee is probably the most familiar of all the invertebrate societies. The honeybees have roughly the same relationship to other members of the Hymenoptera as man does to other primates. Their social organization is vastly more complex and permanent than that of other insects, and they have excited the interest and imagination of scientists and writers from the earliest historical times.

There appears to be a division of labor which is not based on purely biological factors. There are three kinds of adults in the hive: the queen, or fertilized egg-laying female; male drones, which develop from unfertilized eggs; and the workers, which are genetically like the queen but have not been as well fed. It is the worker which shows a great deal of differentiation of labor within itself and which suggests the possibility of psychological differentiation such as is found in some of the higher vertebrate societies.

When bees are marked for individual study, it is found that young ones work mostly around the hive, feeding the larvae, ventilating the hive, and acting as guards around the entrance. They usually do not go on field work until ten days of age. Once a worker bee gets started on a particular occupation, it will stay with it for several days, and

when field work is started a particular bee which carries water, pollen, or nectar to the hive will keep doing this almost indefinitely without any change of occupation. At the same time a bee can show considerable flexibility of behavior. If bees are fed at a particular time of day, they soon come to the feeding spot only at the correct time. When the feeding is stopped, the bees return for a few days at the right time and then stop coming. The implications are that bees are capable of a rather high degree of adaptation, habit formation, memory, and that these abilities make possible the psychological differentiation of social behavior.

The discovery of the system of communication among bees came as a result of a lifetime of study by the German animal behaviorist Von Frisch (1950). When a foraging bee returns to the hive from a rich source of food, it not only deposits its load of pollen and nectar but crawls around on the honeycomb in a way that at first looks like random movement but is actually a definite pattern of behavior which is not the same for every bee. As it moves around, the bee wags its abdomen from side to side, and Von Frisch gave this phenomenon the title of "Schwanzeltanz" or "waggle dance".

Von Frisch did most of his first experiments by placing a feeding station close to the hive. When the bees came back to the hive from these stations, they performed a simple circular movement which he called a "round dance" and in which there is no wagging of the abdomen. In later experiments he moved the site of the feeding station farther away and found that the dance changed to the "waggle dance" between fifty and one hundred meters. The bee regularly goes through a figure-eight motion, stopping in the middle to wag the abdomen, and this is repeated

several times. The bee always headed in a definite direction when wagging her abdomen. In some cases a bee would head upward while doing the wagging part of the dance, and when this happened, the source of food was always in the same direction as the sun. When the bee headed downward, the food was always away from the sun. If a bee danced with its head sixty degrees to the left of the vertical then the food source was sixty degrees to the left of the sun. Von Frisch found that bees were able to locate food accurately within fifteen degrees. Apparently the bee, uses the sun to orient itself, as one would a compass.

All the complicated activities of bees lead to the conclusion that they are able to do something which had long been thought was possible only for human beings, namely, that one bee can tell another the location of something which could not be seen or perceived by either.

The Chicken Hierarchy

A social order which is common, although probably not as well known as the honey bee society is the chicken hierarchy or peck order. A peck order among chickens occurs when one hen usually dominates all the others in the flock. She can peck any without being pecked in return. Second is the hen which pecks all but the top hen, and the rest of the flock are arranged in a descending hierarchy ending in a poor hen who is pecked by all but who can peck no one. Cocks usually do not peck hens, but they establish their own peck order, so a breeding flock usually has two hierarchies, one for each sex.

When grown birds are put together in a pen, they engage in a series of single combats. Some submit without a fight, because of lack of

aggressiveness, poor health, or lack of fighting skill. Once the peck order has been determined, pecking begins to decline in frequency as members of the hierarchy recognize their superiors; eventually a mere raising or lowering of the head may be enough to signify dominance or submission, respectively. Thus the flock becomes comparitively peaceful and conserves energy.

In flocks of birds reared together from hatching, the dominance order develops gradually. Downy chicks rarely peck. They go no farther than a threatening posture or jump. As they grow older, fighting begins and it may be repeated frequently before certain individuals learn to give way habitually to others.

Hens that rank high in the peck order have privileges. They have first chance at the food trough, the dusting areas, the roost, and the nest boxes. The low members of the hierarchy may find themselves driven about ruthlessly in the pen, especially during the early phase of the peck order formation. They have a cowed, submissive appearance. The head is usually lowered and the body feathers are ruffled and unpreened. By contrast the high ranking hens strut around as proudly as pampered show horses.

The high ranking birds feed regularly during the day and crowd together on the roosts for warmth at night, where as the low ranking birds have to feed at twilight or early in the morning while their superiors are roosting. At night they hover timidly on the fringes of the roosting group, often singly, even when it is very cold.

Social disorganization will affect productivity as is shown by A. M. Guhl (1956) in his paper on chicken hierarchy published in the Scientific American.

> We compared two flocks, of which one was allowed to attain a stable peck order and the other was kept disrupted by frequent shifting of its membership. Birds in the unstable flock fought more, ate less food, gained less weight and suffered more wounds. The latest comers had the poorest disposition. The top ranks were occupied by those that had been in the shifting flock longest.

The peck order also influences sexual behavior. Another experiment by Guhl (1956) showed that the males at the top of the peck order win out over their inferiors for mating with hens. When a small group of cocks which had previously shown no significant individual differences in sex drive were placed in a pen with hens, the dominant male was most successful in mating with the hens, while the male ranking lowest in the group's peck order was least successful.

Monkey Groups

In his field studies Dr. Charles Southwick (1963) finds that the majority of primates live in heterosexual groups and definite bonds between individuals can be identified. These bonds are parent to infant bonds, infant to infant bonds, sexual bonds or male to female, and the bond between young males.

The rhesus monkey group is often divided in three subgroups. These are composed of an inner core and then successive rings or shells surrounding it. In the inner core there are generally about twenty-four individuals; a completely dominant male, a sub-dominant male, nine females, six infants, and eight juveniles. The first ring area around the central core is composed of about fifteen individuals; a secondary dominant male, six females, four infants, and four juveniles. The next ring is composed of five subordinate males. Finally, at a distance of two hundred yards away from the group is the peripheral male, an outcast

which never enters the group but will move with them at the established interval. There is some contact between the inner and middle groups and some between the middle and outer group.

The rhesus monkey was originally a plains dweller and relied solely on their vision to avoid other groups. They secondarily moved into the forest but never altered from their dependence on visual avoidance. As a result there is considerable inter-action and fighting between groups of rhesus monkeys.

These groups develop dominance over one another just as individuals have been shown to do in other societies.

The Howler monkey is a forest dwelling group which spends much of its time in the trees and migrate a great deal. They show group territories but there is not much group inter-action due to their vocal and auditory warning system. When a group moves, the males vocalize with grunts. Other groups will move away from any group that they can hear so this eliminates much conflict. They usually clash only when some outside noise, such as a heavy rain storm, damps out the vocalizing.

The central grouping tendency in howlers is to have three males, eight females, three infants, four juveniles, and a variable number of solitary, transitional, non-group-living males. Even though there are fewer males than females, the males play the predominant role in controlling group movements, in regulating status of individuals within the group, and defending and maintaining the integrity with other societies. (Carpenter, 1942).

CHAPTER V

SUMMARY

Like any science, animal behavior may be studied for the simple pleasure of discovering the world around us; but it is so closely connected with the science of human behavior that there are many other pressing and concrete reasons for its advancement. Animal behavior can be a yardstick for human behavior, in that it gives rise to new ideas which can be tested on human beings. However, the most important objective of the science is to develop general ideas and theories which explain the behavior of all animals, including human beings.

The science of animal behavior is primarily concerned with what an animal does. The best observational studies are done under natural or semi-natural conditions, using short sample techniques. These are used to study the daily routine, seasonal cycle, and individual development behaviors. Systematic studies of many representative species are needed in order to lay a firm foundation for the science of comparative animal behavior.

In the strictest sense, the individual who studies animal behavior must be observant to an extraordinary degree and he must be a descriptionist of that same level. Behavior to the ethologist is change, but not necessarily a change connected with movement. So the ability to observe and observe closely, coupled with the ability to describe adequately are prerequisites for the behaviorist.

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VITA

Billie Carden Byers

Candidate for the Degree of

Master of Science

Report: ANIMAL BEHAVIOR, PRESENTED AS A UNIT FOR AN ADVANCED HIGH SCHOOL BIOLOGY COURSE

Major Field: Natural Science

Biographical:

Personal Data: Born in Fort Smith, Arkansas, October 28, 1936, the son of William Leonard and Naomi Ruth Byers.

Education: Graduated from Mulberry High School in Mulberry, Arkansas, in 1954; received the Bachelor of Science degree from The College of the Ozarks in Clarksville, Arkansas, with a double major in Biology and Math-Physics, in June, 1958; completed the requirements for the Master of Science degree from the Oklahoma State University, with a major in Natural Science, in May, 1965.

Professional experience: Began a high school teaching career in the Charleston Consolidated School District, Charleston High School, Charleston, Missouri, in September, 1958; taught biology and mathematics, and coached football, basketball, and track there until June, 1964; belong to the Charleston Classroom Teachers Association, the Missouri State Teachers Association, and the National Education Association.