A STUDY OF THE BEHAVIOR OF THE PIG *SUS SCROFA* BY THE MULTIPLE CHOICE METHOD

ROBERT M. YERKES AND CHARLES A. COBURN
The Harvard Psychological Laboratory and the Franklin Field-Station

INTRODUCTION

The multiple choice method of studying ideational and allied forms of behavior was first briefly described in a lecture on the study of human behavior delivered at Cold Spring Harbor in 1913 [1] It has recently been more fully described in a paper which presents the results of its application in the study of the crow.[2] We shall, in the present report, assume knowledge of the previous descriptions and state only the essential features of the method and its adaptation to the organism observed.

It was devised in the Psychopathic Hospital, Boston, as a means of obtaining comparable records of the ideational behavior of mentally deficient and deranged individuals. But it was also hoped that it might prove widely serviceable as a comparative method for the study of various types of organism.

In many of its essential features, the Yerkes multiple choice method is similar to the Hamilton quadruple choice method,[3] but whereas in the latter four reaction-mechanisms are employed and only problems which, strictly speaking, are insoluble are presented to the subject, the present method involves the use of a variable number of reaction-mechanisms and the presentation of soluble problems of a wide range of difficultness.

The experimenter seeks, in using the multiple choice method, to present to his subject, no matter what its type, age, or condition, a problem which may be solved by the perception of a

[1] Yerkes, Robert M. The study of human behavior. *Science*, 1914, **39**, pp. 625-633.

[2] Coburn, Charles A. and Yerkes, Robert M. A study of the behavior of the crow *Corvus Americanus* Aud. by the multiple choice method. *Journal of Animal Behavior*, 1915, **5**, pp. 75-114.

[3] Hamilton, G. V. A study of trial and error reactions in mammals. *Journal of Animal Behavior*, 1911, **1**, pp. 33-66.

certain constant relation or group of relations within the reaction-mechanisms. For example, the mechanism to be operated may, in the case of one problem, be the middle one of the group, and the total number of mechanisms presented may vary from three to nine. Only by perceiving and appropriately responding to the relation which the experimenter designates as middleness, can the subject solve the problem.

It is necessary only, in the presentation of a varied series of multiple choice problems to a given subject, for the experimenter to devise a type of reaction-mechanism which is appropriate to the action-system of the organism to be observed. We have thus far made use of a simple keyboard for human subjects, while for crows, ring-doves, and rats, we have employed a series of similar boxes, each with entrance and exit doors which can be operated at a distance by the experimenter. The form of device which has proved suitable for the study of pigs will be described in this report.

It has proved very easy to develop suitable mechanisms and we have every reason to suppose that this new method has great advantages over most others for the comparative study of behavior in that essentially the same problems may be presented to extremely different types of subject.

The method has been employed in experiments with normal and defective children, normal and insane adults, pigs, rats, crows, and ring-doves.[4] To all of these subjects, four problems have been presented. They may be described briefly, by definition of the correct reaction-mechanism, as Problem 1, the first mechanism at the subject's right; problem 2, the second mechanism at the subject's left (that is, from the end of the series at the subject's left); problem 3, alternately the first mechanism at the subject's right and the first at its left; problem 4, the middle mechanism of the series.

It has become increasingly clear, as our investigations progressed, that the perfect solution of a problem by a given subject is of much less importance as a matter of record than is detailed information concerning the types of reaction and the appearance and disappearance of reactive tendencies during the course of experimentation. For the solution of a problem means simply

[4] The results of our experiments, except in the case of the crow, have not been published.

the termination of a series of observations. It is essential, therefore, that the experimenter fix his attention rather on the immediate response of his subject than on the attainment of the solution of problems. We especially call attention to this matter because many experimenters seem to feel dissatisfied with other than speedy and completely positive results. It seems fair to insist that by the multiple choice method positive results are obtained even if a subject cannot solve any of the problems which are presented to it.

Since it is our intention to more fully discuss the essential features and the technique of the multiple choice method elsewhere, we shall here content ourselves with these brief introductory statements and references. It should perhaps be added that only by reading the earlier article on the behavior of the crow can the reader hope to fully understand the present report.

SUBJECTS

The subjects of the experiments which constitute the observational basis for this paper were two Chester white pigs. They were born April 1st, 1914, and they were therefore two months old when, on June 2nd, they were taken to the Field Station from an adjoining farm and placed in the experimental situation. We shall refer to these individuals as the male and the female, since both sexes were represented. The male, however, had been castrated before we obtained the animals.

From the first, individual differences were conspicuous. The male was considerably smaller and less active and energetic than the female; he ate less and showed less initiative. Throughout the period of observation, both animals were in perfect health and at no time was there reason to suppose that either environmental or physiological conditions were unfavorable to our experiments.

From birth these pigs lived practically out of doors, having a yard to run in and a rather open shelter from storm.

Although the experimenters had expected much of the pigs because of the indications from casual observation of their behavior, it may be said at once that they proved far more satisfactory subjects than we had dared to hope. Indeed, they worked so steadily and uniformly through the investigation that there was practically no loss of time. It is chiefly because of

this unexpectedly favorable relation of subject to method that we were enabled to obtain, during the summer of 1914, the numerous results reported below.

APPARATUS

Fortunately, it was possible at the Franklin Field-Station to locate our apparatus in an orchard convenient to the buildings. A rough shelter was built for the pigs under a large apple tree, and convenient yards were arranged by the appropriate use of wire fencing.

The accompanying figures give a fairly good idea of the experimental situation. In figure 1 A, the multiple choice apparatus appears in the foreground, behind a fence which completely surrounds the enclosure. Immediately in front of the apparatus is a bench for the observer. Systems of weighted cords, conspicuous in 1 A, enable the experimenter to operate the slide doors of the multiple choice boxes.

The arrangement of the yards is made clear by figure 1B and figure 2. It was necessary to be able to isolate the pigs for observation as well as to have the apparatus so arranged that an individual could readily be admitted for a trial and on the completion of its reaction, be returned to its appropriate yard.

The multiple choice apparatus proper consists of nine similar boxes, shown in ground plan in figure 2. They were built of rough boards and numbered conspicuously 1 to 9. Each box is sixty inches long, by twenty inches wide, by forty-eight inches deep, with a slide door at each end. The distance between these doors on the inside of the box is forty-eight inches.

From each of the entrance and exit doors a woven window-weight cord extends upward, through a pulley, then horizontally forward through another pulley, and downward, ending in a weight nearly over the observer's bench. To all of the cords from the entrance doors, white weights were attached; to all from exit doors, black weights. Each weight was sufficient to hold its door in position after the latter had been raised. It was found that this required about ten pounds, and iron window weights served our purpose.

In front of the exit door of each box is a v-shaped food trough which is divided into nine like parts by the partitions between

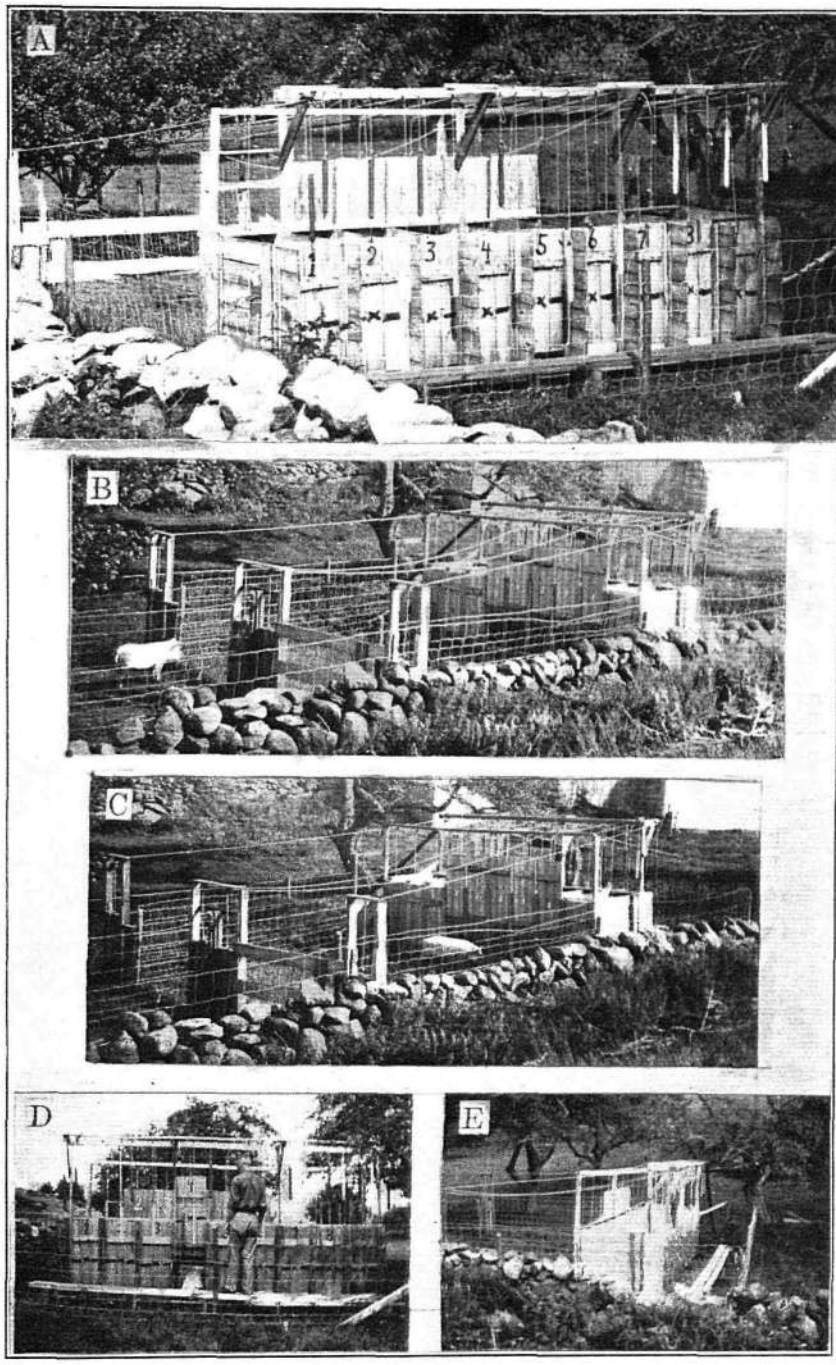

FIGURE 1. Multiple Choice Apparatus for Use with Pigs

A. The reaction-mechanisms from the experimenter's position, showing weighted cords for operating doors. Entrance doors 2 to 6 are raised.

B. The same from the pig's point of view, showing one pig waiting in yard for trial. Entrance doors 2 to 6 raised as in figure A.

C. The same view as that of figure B except that the pig has been admitted to the reaction-space and is about to enter the middle box (no. 4) of those whose doors are open.

D. Here the pig is shown, after appropriate reaction, feeding in the trough of box no. 4. The experimenter appears in the position necessary for manipulation of cords and observation of response.

E. The reaction-mechanisms seen from one end.

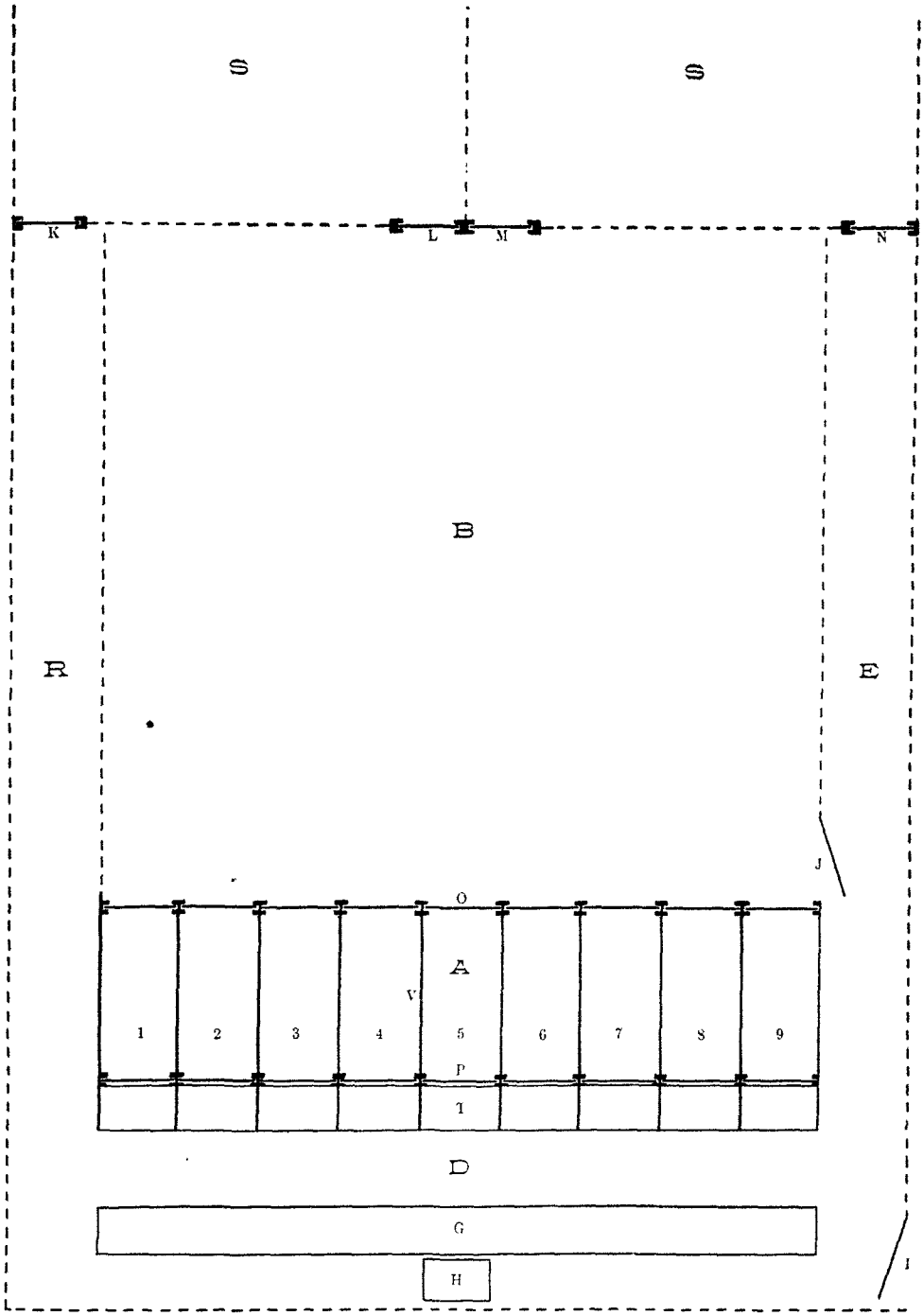

FIGURE 2. Ground Plan of Multiple Choice Apparatus Used for Pigs. Scale $\frac{1}{18}$

A, reaction mechanisms, nine similar boxes or stalls; V, stall number 4; O, entrance door of box; P, exit door of box; T, food trough of box; G, observer's stand and H, writing table, D, runway between trough, T, and stand, G; S, S, yards; B, reaction space; R, E, alleys or runways connecting D with S; I, observer's entrance door to apparatus; J, observer's entrance door to reaction space B; L, M, slide doors between yards and reaction space; K, N, slide doors between yards and alleys.

The weighted cord systems for operating the entrance and exit doors (twenty in all) are not shown in this figure. They may be seen in figure 1, A, B, and C.

boxes. When the exit doors are down, the various parts of the food trough are covered by a horizontally placed sheet of metal, which fits closely over them and thus prevents the subjects from obtaining food from the outside of the apparatus.

The large enclosure is divided into four principal parts. (1) the part which contains the reaction-mechanisms with space for the observer's bench, G, and writing table, H, and a passageway for the subject from the exit doors of the apparatus to the yard, S; (2) second, the reaction space which is labelled B in figure 2, in which the subject responded to the multiple choice situation; (3) and finally, the two yards, S, S, from which the subjects started in the case of each trial and to which they returned on the completion of their reaction. K, L, M, and N, designate slide doors between the several portions of the large enclosure, while J and I represent doors which were used by the experimenter.

The entire apparatus was constructed in sections, so that at the end of the season it might readily be taken down and stored.

This brief and very incomplete description will be supplemented somewhat in the section on experimental procedure.

PROBLEMS AND GENERAL METHOD

The four problems enumerated on page 186 were presented to each subject in the order named. For each of these problems, a series of ten settings of the doors was determined upon. These settings differ somewhat from those employed in our study of the crow. It is our intention, so far as possible, to use them with all types of subjects until our observations indicate desirable changes.

We present below for each of the four problems (1) the numbers of the settings, (2) the numbers of the doors open, (3) the total number of doors open in each setting and for the series of ten settings, and (4) the number of the right door.

It was our plan to give each subject an opportunity to respond to each of the ten settings for a given problem in order and to return then to setting 1 and repeat the series. It was found impossible, however, to give ten trials in succession in our early experiments, and in the case of both problems 1 and 2, as a rule a subject was given five trials in succession. For problems 3 and 4 it was found possible to give ten trials in succession.

PROBLEM 1. First Mechanism at the Subject's Right

Settings	Doors open	No. of doors open	No. of right door
1	**1**.2.3.	3.	1
2	.**8**.9	2	8
3	**3**.4.5.6.7	5	3
4	**7**.8.9	3	7
5	**2**.3 4 5.6.	5.	2
6	**6**.7.8	3.	6
7.	**5**.6 7	3	5
8	**4**.5 6 7 8.	5.	4
9	**7**.8 9	3	7
10	**1**.2 3	3.	1
	Total	35	

PROBLEM 2. Second Mechanism at the Subject's Left

Settings	Doors open	No of doors open	No. of right door
1	7 **8**.9	3.	8
2	1 2 **3**.4	4	3
3	2 3 4 5 **6**.7*	5	6
4	1 2 3 4 **5**.6	6	5
5	4 5 6 **7**.8	5	7
6	1 **2**.3	3	2
7	2 3 **4**.5	4	4
8	1 2 3 4 5 6 7 **8**.9	9	8
9	.1 2 **3**.4	4	3
10	3 4 5 6 **7**.8	6.	7
		Total 50	

*Changed from 3 4 5 **6**.7 to 2 3 4 5 **6**.7 after about one hundred trials.

PROBLEM 3. Alternately the First Mechanism at Subject's Right and the First at Its Left

Setting	Doors open	No. of doors open	No. of right door
1	**5**.6 7	3.	5
2	5 6 **7**.	3	7
3	**1**.2 3 4 5.6	6	1
4	1 2 3 4.5 **6**.	6	6
5	.**4**.5 6 7 8	5.	4
6	.4 5 6 7 **8**.	5	8
7	**2**.3 4 5	4	2
8	.2 3 4 **5**.	4	5
9.	**3**.4 5 6 7 8 9	7	3
10	3 4 5 6 7 8 **9**.	7	9
		Total 50	

PROBLEM 4. Middle Mechanism of the Series

Setting	Doors open	No. of doors open	No. of right door
1	2. **3.** 4	3	3
2	5 6 **7.** 8 9	5	7
3	1 2 3 **4.** 5 6 7	7	4
4	7 **8.** 9	3	8
5	4 5 **6.** 7 8	5	6
6	1 2 3 4 **5.** 6. 7 8 9	9	5
7	1 **2.** 3	3	2
8	2. 3 **4.** 5 6	5	4
9	3 4 5 **6.** 7 8 9	7	6
10	6 **7.** 8	3	7
		Total 50	

Both punishment and reward were used in these experiments The punishment consisted of confinement for a definite interval, usually one minute, in each wrong box entered, while the reward consisted of food which could be obtained in the trough of the right box.

EXPERIMENTAL PROCEDURE

We shall now briefly enumerate, in order to supplement the descriptions of apparatus and methods which have been given, the steps in a regular series of observations.

The experimenter having entered the enclosure with a supply of food, record-book, stop-watch, etc., first raises each of the nine exit doors and places in each section of the trough a quantity of food (sour milk, shelled corn, vegetables). He then lowers the exit doors, thus covering the food, and takes his position on the observation bench. In case both pigs are in the shelter yard, it is next necessary for him to drive one of them into the other yard. This having been done, he may proceed to set the entrance doors for the first trial. Let us suppose that the problem to be presented is problem 1 and that setting 1 is first to be used. In this case the experimenter raises entrance doors 1, 2, and 3. He is now ready to admit one of the pigs to the reaction space B of figure 2. This he does by raising momentarily the appropriate slide door between B and S.

The instant the pig enters the reaction space, the experimenter starts his stop-watch and begins to record the important features of the behavior of the animal, noting especially its approach to the several doors, its tendency to enter boxes and the actual entrance and time of entrance into any one of the three acces-

sible boxes. Let us suppose that the animal enters directly box 3. Immediately the experimenter lowers the entrance door and thus confines the animal in the small compartment as punishment for an incorrect choice. At the expiration of one minute, the entrance door is raised and the pig is allowed to retreat from the box and make another choice. We may now suppose that the animal, after passing in front of boxes 2 and 1, returns to 1 and enters it. The experimenter immediately stops his stop-watch, lowers the entrance door, and, since this box is by definition the right one, he immediately raises the exit door and rewards the animal for correct choice by allowing it to eat for a few seconds. He then, either by speaking to the pig or by touching it with a whip, induces it to pass from the box by way of the passage, D, and the alley, R or E, back to the appropriate yard, S.

Having reset the apparatus, the experimenter now gives the other pig a trial with the same problem and either with the same or with a different setting of the doors

As a rule, the animals were fed only in the trough of the apparatus. They were almost always hungry, and although sufficiently well fed to keep them growing and in excellent health, they usually seemed fairly hungry at the end of a day's work. In no case was it necessary, in order to induce them to work steadily, to have them extremely hungry.

The influence of visual and olfactory factors was to be expected, and at various points in the investigation, precautions had to be taken against following.

PRELIMINARY TRAINING

On June 2nd the pigs were brought to the Field Station and placed in the shelter yard, and in the afternoon of the same day, they were fed in the trough of the apparatus, all of the doors of the boxes and the yards being raised.

During the next six days they became thoroughly accustomed to the apparatus and learned both to feed in the trough and to make the trip readily from the yards, through the apparatus, and back to the starting point. They very quickly and satisfactorily adapted themselves to the situation, while at the same time becoming thoroughly tame and indifferent to the presence of the experimenter.

On June 9th it seemed fitting to attempt a series of preliminary trials. Each animal was given, in turn, opportunity to secure food in each of the nine boxes. When the subject entered the reaction space, B, the entrance door of a certain box stood open, and as soon as the animal had entered that box, the experimenter closed the door behind it and opened the exit door in front of it, thus enabling it to obtain food. During these preliminary trials, the pigs were in separate yards and were given their trials alternately.

We shall now report the results of our regular experiments.

RESULTS OF EXPERIMENTS

As it is essential to present the data for each trial in the series of experiments, tables 1, 3, 4, 6, 7, 9, and 10 have been constructed after the following manner. At the head of each table stand the several settings, the letter S serving as an abbreviation for setting and the number following it designating the place of the setting in the series. Immediately under the number of the setting appear the numbers of the doors open with the one to be chosen (correct one) printed in bold face type. Below this preliminary information concerning the particular problem in question, appear the results for each of the trials of each subject. The column headed T gives the number of a trial in the total series of trials for a given subject, in a given problem. Following the number of the trial are the numbers of the boxes entered, in the order of entrance. Referring to table 1, we discover that the female in her first trial under problem 1 selected, of the three boxes whose doors were open, first, number 3 She was, of course, punished by being confined in this box for one minute, and on release entered box 1, which was the correct box, and received the reward of food. Or again, in table 3 it may be noted that in trial 146, under problem 2, the female entered, in order, boxes 7, 9, 7, and 8, the group of open doors including 7, 8, and 9, and the box to be entered being number 8.

These tables will enable the reader to obtain quickly definite information concerning the forms of response and the changes therein during the course of experimentation. We shall present the several tables under the problem numbers and reserve further comment for the section on the discussion of results.

DISCUSSION OF RESULTS

The results will now be discussed under the headings of the four problems, and in connection with each a condensed tabular summary of the experiments will be offered, together with such comments as are necessary on the experimental procedure, the behavior of the subjects, and the significance of the various forms of response.

PROBLEM 1

This problem, for which the definition of the correct mechanism is the first at the subject's right, proved extremely easy for the pigs. Incorrect choices were surprisingly few, and the number of trials necessary for the perfect solution of the problem was also surprisingly few for both subjects, the female having chosen correctly throughout a series of ten settings at the end of forty trials and the male having similarly succeeded at the end of forty-five trials.

As is indicated by tables 1 and 2, which contain all of the data for this problem, the experiments were not discontinued at this point, but each individual was given additional opportunity to work out the problem. In the light of our later experience, this was a mistake, but at the time we were unconvinced that the animals were depending upon the relation of the correct mechanism to the other members of the group, and we proceeded further with our observations in order to settle certain points which were in doubt.

From the first it was evident in connection with this problem that the female was more intelligent than the male, and that he tended to be markedly influenced by her. After observations were discontinued with her on June 14th, he reacted very poorly for a number of series, and then again improved and reacted perfectly in the last three series given on June 15th.

In this problem the total number of doors open in the ten settings was, as may be seen by reference to the data presented on page 191, thirty-five. Of these, ten were of course correct. Hence the probability of a correct first choice apart from experience would be 1 to 2.5. In table 2, it appears from the data of the last column for each individual that the ratio of correct to incorrect first choices was on the first day of training 1 to 1 for the female and 1 to 2.33 for the male. It should here be stated that in table 2, as well as in the like tables for the other

TABLE 1

RESULTS FOR FEMALE IN PROBLEM 1

	S. 1		S. 2		S. 3		S. 4		S. 5		S. 6		S. 7		S. 8		S. 9		S. 10
T.	**1**.2.3	T.	**8**.9	T.	**3**.4.5.6.7	T.	**7**.8.9	T.	**2**.3.4.5 6	T.	**6**.7.8	T.	**5**.6 7	T.	**4**.5.6.7.8	T.	**7**.8.9	T.	**1**.2.3
1	3.1	2	8	3	6 3	4	7	5	2	6	7.8.6	7	7.5	8	4	9	7	10	3.1
11	1	12	8	13	7.4.3	14	7	15	2	16	6	17	5	18	4	19	7	20	1
21	2.1	22	8	23	3	24	7	25	3.2										
26	1	27	8	28	5.3	29	5.7	30	2	31	6	32	5	33	4	34	7	35	1
36	1	37	8	38	3	39	7	40	2	41	6	42	6 5	43	4	44	7	45	1
46	1	47	8	48	3	49	7	50	2	51	6	52	5	53	4	54	7	55	1
56	1	57	8	58	3	59	7	60	3.2	61	6	62	5	63	5.4	64	7	65	1
	1.2.3.4.5		**5**.6.7.8.9		**3**.4.5.6		**7**.8.9		**2**.3.4.5 6.7.8.9										
1	1	2	5	3	3	4	7	5	2										

RESULTS FOR MALE IN PROBLEM 1

1	2.3.1	2	8	3	7 6.3	4	9 7	5	2	6	8.7.6	7	6.5	8	4	9	9.7	10	2.3.1
11	3.1	12	8	13	7.5.3	14	8.9.7	15	2	16	7 6	17	5	18	6 5.4	19	7	20	3.2.1
21	2.1	22	8	23	6.3	24	7	25	6.4.2										
26	1	27	8	28	3	29	8 7	30	2	31	7.6	32	6.5	33	4	34	7	35	1
36	1	37	8	38	3	39	7	40	2	41	6	42	5	43	4	44	7	45	1
46	1	47	8	48	3	49	7	50	6 2	51	8 6	52	7.7.5	53	8.4	54	8.7	55	1
56	1	57	8	58	3	59	7	60	5.2	61	6	62	5	63	4	64	7	65	3.1
	1.2.3.4.5		**5**.6.7.8.9		**3**.4.5.6		**7**.8.9		**2**.3.4 5 6.7.8.9										
1	3.1	2	5	3	3	4	9.7	5	4.2										
6	3.1	7	5	8	3	9	9.7	10	5.2										
66	3.1	67	8	68	3	69	8.7	70	2	71	6	72	6.5	73	4	74	7	75	1
76	1	77	8	78	3	79	7	80	2	81	6	82	5	83	4	84	7	85	1
	1.2.3.4.5		**5**.6.7.8.9		**3**.4.5.6		**7**.8.9		**2**.3.4.5 6.7.8.9										
11	1	12	5	13	3	14	7	15	2										

TABLE 2

DAILY SERIES AND AVERAGES WITH RATIOS OF CORRECT TO INCORRECT FIRST CHOICES

PROBLEM 1

Female							Male						
Date	No. of trials	R	W	R	W	Ratio of R to W	Date	No. of trials	R	W	R	W	Ratio of R to W
June							June						
10	1- 5	3	2				10	1- 5	2	3			
"	6-10	2	3	5	5	1.1	"	6-10	1	4	3	7	1:2 33
11	11-15	4	1				11	11-15	2	3			
"	16-20	5	0				"	16-20	2	3			
"	21-25	4	1	13	2	1: 15	"	21-25	2	3	6	9	1:1 50
12	26-30	4	1				12	26-30	4	1			
"	31-35	5	0				"	31-35	3	2			
"	36-40	5	0				"	36-40	5	0			
"	41-45	4	1	18	2	1: 11	"	41-45	5	0	17	3	1: 18
13	46-50	5	0				13	46-50	4	1			
"	51-55	5	0				"	51-55	1	4			
"	56-60	4	1				"	56-60	4	1			
"	61-65	4	1	18	2	1. 11	"	61-65	4	1	13	7	1: 54
14	1- 5	5	0	5	0	1·0	14	1- 5	2	3			
							"	6-10	2	3	4	6	1.1 50
							15	66-70	3	2			
							"	71-75	4	1			
							"	76-80	5	0			
							"	81-85	5	0	17	3	1: 18
							"	11-15	5	0	5	0	1:0

problems, the data refer only to first choices in each trial, the column headed R containing the number of correct first choices and that headed W the number of incorrect first choices for each series of trials or for the day. It further appears from this table that five trials constituted the regular series in problem 1, and it should here be stated that the experimenter always resumed experimentation at the point in the regular series of settings at which work had been interrupted. He therefore proceeded in regular order from setting 1 to setting 10 and then returned to setting 1 and repeated the trials.

Further comment on the behavior of the animals in problem 1 is needless, for the task is but slightly more difficult than the acquisition of a simple position habit, and it has already been satisfactorily demonstrated that many of the vertebrates acquire such habits with ease.

PROBLEM 2

For this problem, which is definable as the second mechanism from the subject's left, all of the data for discussion will be found in tables 3, 4, and 5. Again, as in the case of problem 1, the regular series consisted, throughout the training, of five trials, but as many as six such series were given on a single day. Bracketed series appearing, for example, in table 5, under the dates June 23, 24, 25, and 28 and July 1, 2, 3 and 4, were continuous, that is, ten trials were given in succession instead of only five.

For the ten settings of problem 2, the total number of open doors is fifty, and the expectation therefore is that prior to experience an animal will choose correctly once in five times, thus giving a ratio of right to wrong choices of 1 to 4. That this expected ratio does not appear on the first day of experimentation is due to the effect of the previous training in problem 1. The tendency to enter the first box at the left was persistent in both subjects and often that box was re-entered a number of times in spite of punishment. In tables 3 and 4 the data for these statements are presented, and in table 5 it may be noted that on the first day of work on problem 2 neither subject made a single correct first choice.

The ratio of correct to incorrect first choices for the female rapidly, although somewhat irregularly, decreased with experience until on July 4th it stood 1 to .19. On this date she succeeded in choosing correctly in ten successive trials, and was therefore considered to have solved the problem perfectly.

Similarly, the ratio for the male changed fairly rapidly until on July 11th it stood 1 to .11. At this time, although he had not succeeded in choosing correctly in each of the ten settings consecutively, his training was discontinued, for he had already delayed experimentation with the female for a week, and it was perfectly clear that although he made an occasional error, he was capable of perfectly solving the problem.

Whereas the female finished this problem as a result of 390 trials, the male had made only nine out of ten correct choices at the end of 520 trials, when his training was discontinued. We are inclined to think that this is a reliable indication of the difference in docility between these two individuals.

We shall now turn to tables 3 and 4 for a further brief analysis of the reactions.

For about 50 trials in problem 2, both pigs showed the effect of their experience in problem 1. Then the number of correct first choices rapidly increased for each of the ten settings. There were in the case of setting 1 few mistakes on the part of the female after 150 trials, whereas on the part of the male there were more than twice as many incorrect first choices. The same holds in general of each of the other settings, she proving herself much more steady and predictable in response than he This was doubtless due in a measure to hunger, for it was much more difficult to keep him in the proper condition of eagerness for food than her.

The data of these tables indicate no definite and persistent reactive tendencies during the course of experimentation other than the original acquired tendency to enter the first box at the right in the group and the subsequently acquired tendency to select the second box from the left in the group. Certain of the settings proved very much more difficult than others. Contrary to expectation, difficultness is not directly variable with the number of doors open. Setting 1, for example, as contrasted with setting 6, is much the easier, yet three doors are open in each case. In general, however, it is evidently true that the larger the group of open doors the more difficult it is for the animal to choose correctly and the larger the number of mistakes in a given trial, if the first choice is not correct.

From the behavior of the two pigs in this problem, as contrasted with the first, it is safe to conclude that they are perfectly capable of selecting the proper reaction, mechanism by its relation in a group of similar mechanisms when the number in the group is as large as nine and when the constant relation of the correct mechanism is second from one end. It is further clear that this problem is a much more difficult one for the pigs than problem 1. But it is also certain that the difference in difficultness is not indicated by the difference in the number of experiences necessary for the solution of the problems, since the early days of work on problem 2 served merely to overcome the tendency acquired in connection with problem 1. It seems probable that should we subtract 100 trials from the totals under problem 2 we should have a fair basis of comparison

TABLE 3

RESULTS FOR FEMALE IN PROBLEM 2

T.	S. 1	T.	S. 2	T.	S. 3	T.	S. 4	T.	S. 5	T.	S. 6	T.	S 7	T	S. 8	T.	S. 9	T.	S. 10
	7.8.9		1.2.3.4		3.4 5.6.7		1.2 3 4.5.6		4.5.6.7.8		1 2.3		2.3 4.5		1.2.3.4.5 6 7.8.9		1.2.3.4		3.4 5 6 7.8
1	7.8	2	1 1.1 1.1.1 7.4.3a†	3	3.7.3.6	4	6 3.6.2 1.6.5a	5	8 4.5 7a	6	3 1.3.3 3.1.2a	7	5 2.5 4a	8	6.4.8	9	4.3a	10	*4 8.8 5 7
11	8	12	3	13	5.7.3.5 6	14	6.1.5	15	6.8.4.7	16	3.1.2	17	2 4	18	2 7 4.8	19	4.1.4.4.3	20	8.7
21	7.8	22	1.4.4 4.3	23	3.6	24	6.3.4 6.3 6 1 4.5	25	5.8.7	26	2	27	2 5.2.5 5.3 4	28	7.1.4.8	29	4 3	30	7
31	7 8	32	4.2.3	33	7.6	34	5	35	6.8.5.8 6 4.8.7	36	1.2	37	5.4	38	6.8	39	4.2.4 1.4 3	40	8.6.3 5 8.6 4 8.3.7
41	7.9.8	42	4.2 4 1 3	43	7.6	44	5	45	8 6.5.4 8.5.7	46	3.3.2	47	5.4	48	7.9.6.7 5.8	49	3	50	8.7
51	8	52	3	53	6	54	6.2.5	55	7	56	3 3.2	57	5 2.4	58	8	59	4.3	60	7
61	8	62	2.4.1.3	63	7.6	64	6.5	65	8.4.5 7										
66	7.8	67	3	68	7 5.7 5.6	69	1.6.2 6.5	70	8 7	71	2	72	4	73	7.9 3 6.2.8	74	4.3	75	5.7
76	7.9.7.8	77	4.3	78	7.6	79	6.5	80	8 5 8.4.7	81	1.3.2	82	4	83	7.8	84	2.4.3	85	7
86	7.8	87	2.4.3	88	7.6	89	6.5	90	8.7	91	3.2	92	2.5 4	93	7 8	94	4.2.3	95	8.7
96	8	97	3	98	7.6	99	6.5	100	8.5.7	101	3.2	102	5.4	103	8	104	2.3	105	8.6 7
106	7.8	107	4.3	108	7 6*	109	3.6 6.4 5	110	8.5.7	111	1 2	112	5.5.4	113	8	114	3	115	8.6.7
116	7.7.8	117	2.4.3	118	5.6	119	3.5	120	8.8 7	121	3.2	122	2.5 4	123	7 8	124	3	125	8.7
126	7.8	127	3	128	7.6	129	3.5	130	5.7	131	3.2	132	2.4	133	7.7.4 8	134	3	135	3.8.6 7
136	7.8	137	3	138	6	139	2.3.4.5	140	5.7	141	2	142	2.4	143	3.7.6 3.5.8	144	4.3	145	5.8.7
146	7.9.7.8	147	4.3	148	3.6	149	5	150	7	151	3.2	152	5.4	153	8	154	4.2.3	155	8.5.7
156	7.8	157	3	158	7 6	159	6.5	160	5 8.7	161	3.2	162	4	163	8	164	3	165	8.7
166	7.8	167	3	168	5.6	169	5	170	7	171	2	172	4	173	8	174	3	175	8.7
176	8	177	3	178	4 6	179	3.5	180	8 7	181	2	182	5 3.3 4	183	7.8	184	3	185	7
186	8	187	3	188	7.6	189	3.5	190	7	191	3.2	192	5.4	193	8	194	3	195	7
196	8	197	2.3	198	7.6	199	3.5	200	8.7	201	3.2	202	5.5.4	203	8	204	3	205	7

206	8	207	3	208	7.6	209	2 5	210	8.7	211	1.3 2	212	4	213	8	214	3	215	8 7
216	8	217	3	218	7.6	219	3 5	220	8.7	221	2 •	222	5 3 4	223	7 7.7.8	224	3	225	8 6.7
226	8	227	4.3	228	6	229	6.5	230	8.7	231	3 2	232	4	233	8	234	3	235	3 6.7
236	8	237	3	238	7 6	239	6 5	240	8 7	241	2	242	4	243	8	244	3	245	7
246	8	247	3	248	6	249	4.3.5	250	7	251	2	252	4	253	8	254	3	255	7
256	8	257	3	258	7 6	259	3.5	260	8 7	261	3 2	262	5 3.2.5 4	263	8	264	3	265	7
266	8	267	3	268	6	269	5	270	8.6 7	271	2	272	3.5 4	273	8	274	4.3	275	7
276	8	277	4.3	278	6	279	6.5	280	8.7	281	3.2	282	4	283	8	284	3	285	7
286	8	287	4.2.3	288	6	289	5	290	7	291	3.2	292	4	293	7.8	294	4.3	295	7
296	8	297	3	298	6	299	5	300	7	301	3 2	302	5.4	303	8	304	3	305	8.7
306	8	307	4 3	308	7.6	309	5	310	7	311	3.2	312	4	313	8	314	3	315	7
316	8	317	3	318	6	319	5	320	7	321	3.2	322	5.4	323	7.8	324	3	325	7
326	8	327	3	328	6	329	5	330	7	331	2	332	4	333	7.6 8	334	3	335	7
336	8	337	4.3	338	6	339	5	340	7	341	3.2	342	4	343	8	344	3	345	7
346	8	347	3	348	6	349	5	350	7	351	2	352	3 2 2.5 4	353	7.6 8	354	4.3	355	7
356	8	357	3	358	6	359	6 5	360	7	361	3.2	362	5.4	363	8	364	3	365	7
366	8	367	3	368	6	369	4.5	370	7	371	3.2	372	4	373	7 8	374	3	375	7
376	7.8	377	3	378	6	379	5	380	7	381	2	382	4	383	8	384	3	385	7
386	8	387	3	388	6	389	5	390	7										
391	8	392	3	393	6	394	5	395	6.7	396	2	397	4	398	8	399	3	400	7

* Setting 3 was changed in this series and the succeeding series from 3.4.5.6 7 to 2.3.4 5.6.7 in order to make the ratio of right doors to wrong doors in the series of ten settings 10.40.

† The letter "a" indicates that the pig was aided in choosing the right door.

TABLE 4

RESULTS FOR MALE IN PROBLEM 2

T.	S. 1	T.	S. 2	T.	S. 3	T.	S. 4	T.	S. 5	T.	S. 6	T.	S. 7	T.	S. 8	T.	S. 9	T.	S. 10
	7.8.9		1.2.3.4		3.4.5.6.7		1.2.3 4.5.6		4.5.6.7.8		1.2.3		2 3.4.5		1.2.3.4.5 6.7.8.9		1.2.3.4		3.4.5 6.7.8
1	7.7.7 7.7.7 9.7.8	2	1.4.1.3	3	3.3.6	4	1.5	5	6.4.7	6	1.1.2	7	5.2.5 2 5.3.5.4	8	1.5.8	9	4.1.4.2 1.4.1 2.4.1.3	10	8.7
11	8	12	4.1.2 4.3	13	7.6	14	6.4.1 6.2 4 6 3.5	15	7	16	3 1 3 1.3.2	17	5 2 5 3 2.5.4	18	7.9.8	19	3	20	8.7
21	8	22	2.4.1 4.3	23	7.6	24	6.5	25	8.8.7	26	1.3.2	27	2.5 5.4	28	8	29	4.2.1 4 2.3	30	8.7
31	8	32	3	33	7.3.4.3.6	34	6.5	35	8.4.6.4 7	36	1.3.2	37	5.2.4	38	9 6 8	39	3	40	8.3.7
41	8	42	4.2.3	43	7.6	44	6.6.3.2 4.3.5	45	8.7	46	3.2	47	5.4	48	7.6.4.3 2.1.9.8	49	3	50	8.7
51	8	52	4.3	53	7.6	54	5	55	8.7	56	1.3 2	57	5 4	58	7.8	59	3	60	8.7
61	8	62	3	63	6	64	3 6.5	65	4.8.7										
66	8	67	3	68	7.6	69	4.3.5	70	8 7	71	2	72	5.3.2 5.4	73	8	74	4 3	75	8.7
76	9.7.8	77	4.3	78	3.3.7.6	79	1.3 2.5	80	8.7	81	3.2	82	5.2.2.4	83	8	84	4.3	85	7
86	8	87	3	88	7.6	89	5	90	8.7	91	2	92	5.4	93	8	94	3	95	6.5 4 3.8.7
96	7.7.9.8	97	3	98	5.3.7.6	99	2.5	100	4.8 7	101	2	102	4	103	7.6 4.8	104	4.2.3	105	8.7
106	9.8	107	4.3	108	7.6*	109	4.3 2.5	110	8 7	111	3.2	112	5.4	113	8	114	3	115	8.7
116	8	117	3	118	6	119	5	120	8.7	121	3.2	122	5.4	123	7 6.5 4 3.8	124	3	125	8.7
126	8	127	4.3	128	7.6	129	5	130	8 6.5.7	131	2	132	3.4	133	8	134	3	135	8.7
136	8	137	2.4.3	138	6	139	6 5	140	8 7	141	2	142	5.4	143	8	144	3	145	3.7
146	8	147	3	148	6	149	5	150	7	151	3.2	152	5.4	153	8	154	3	155	8.7
156	8	157	2.1.4.3	158	6	159	5	160	7	161	3.2	162	5.2.5.5.4	163	7.6.8	164	3	165	7
166	8	167	3	168	6	169	5	170	7	171	3.3.2	172	5.3 2.5.4	173	8	174	3	175	8.7
176	8	177	3	178	5.4.3.7.6	179	2.3.5	180	8.7	181	2	182	4	183	8	184	3	185	5.7
186	7.8	187	3	188	7.3.6	189	4.5	190	6.8.7	191	2	192	4	193	8	194	4.3	195	8.7
196	8	197	4.3	198	7.6	199	2.3.5	200	8.7	201	3.2	202	5 4	203	8	204	3	205	7
206	8	207	3	208	7.6	209	5	210	8.7	211	3.2	212	5.4	213	8	214	3	215	8.7
216	7.8	217	3	218	5.4.7.6	219	5	220	8.7	221	2	222	5.4	223	8	224	3	225	8.7

226	8	227	4.3	228	7.6	229	5	230	8.7	231	3.2	232	5 4	233	8	234	3	235	7
236	8	237	3	238	6	239	5	240	8 7	241	3.2	242	5.4	243	{7.6.4.3 2.9.8	244	3	245	7
246	8	247	3	248	6	249	5	250	8.7	251	3.2	252	5.4	253	8	254	3	255	5.4.3.7
256	8	257	3	258	5 4.3.2.6	259	5	260	8.6.5.4 7	261	2	262	4	263	8	264	3	265	6 5.4.3.7
266	8	267	2.3	268	6	269	5	270	7	271	3.2	272	5.4	273	8	274	4.2.3	275	7
276	7.8	277	3	278	{3 2.5 4 2.6	279	6 5	280	7	281	2	282	3.4	283	8	284	3	285	7
286	7.8	287	3	288	5.6	289	3.4.6.5	290	7.5.7	291	2	292	2.3.5.4	293	7.6.8	294	3	295	5.6.5.8.7
296	8	297	3	298	5.4.3.7.6	299	5	300	7	301	2	302	5.4	303	8	304	2.3	305	7
306	8	307	3	308	7.6	309	5	310	5.4.8.7	311	3.2	312	5.4	313	8	314	3	315	7
316	8	317	3	318	5.6	319	4.6.2 5	320	7	321	2	322	4	323	{7.6.5.4 3.2.7.8	324	3	325	4.8.7
326	8	327	3	328	6	329	4.3.2.1 5	330	7	331	2	332	5.4	333	8	334	3	335	6.5.7
336	8	337	3	338	6	339	5	340	4.6.5.7	341	3.2	342	5.4	343	8	344	4.3	345	7
346	7.9.8	347	3	348	5.4.5.6	349	5	350	5.5.7	351	2	352	3 4	353	8	354	3	355	5.6.8 7
356	8	357	4.3	358	7.6	359	6.5	360	7	361	3 2	362	5.4	363	8	364	3	365	7
366	8	367	4.3	368	6	369	5	370	7	371	3.2	372	3.5.4	373	8	374	3	375	7
376	8	377	4 3	378	6	379	6.5	380	7	381	3.2	382	2.4	383	8	384	3	385	7
386	8	387	4 3	388	7.6	389	5	390	7										
391	8	392	3	393	6	394	5	395	7	396	3.2	397	5.4	398	8	399	2.3	400	7
401	8	402	4 3	403	7.6	404	5	405	7	406	3.2	407	4	408	7.6.5.8	409	2.4.3	410	{8.4.3.6 5.8.6.7
411	7.8	412	3	413	6	414	4.5	415	7	416	3.2	417	5.4	418	7.6.8	419	2.3	420	7.6.8.5.7
421	8	422	3	423	{7.5 3 2.6	424	5	425	7										
426	8	427	4 3	428	7.6	429	5	430	8.7	431	3.2	432	5.4	433	8	434	4.3	435	8.7
436	8	437	3	438	5.7.6	439	3.2.1.5	440	7	441	3.2	442	5.4	443	7.6.8	444	3	445	7
446	8	447	3	448	6	449	5	450	8.7	451	3.2	452	5.3.4	453	8	454	3	455	7
456	8	457	3	458	6	459	5	460	7	461	3.2	462	5.4	463	7.6.8	464	3	465	7
466	8	467	3	468	5.4.7.6	469	5	470	7										
471	8	472	3	473	6	474	5	475	7	476	3.2	477	5.4	478	7.6.8	479	3	480	6.5.7
481	7.8	482	3	483	6	484	4.3.2.5	485	6 5.7	486	3.2	487	5.4	488	7 5.8	489	3	490	5.7
491	8	492	3	493	6	494	3.2 5	495	6 4.7	496	2	497	3.4	498	7.8	499	3	500	7
501	8	502	3	503	6	504	5	505	6 7	506	3.2	507	5.4	508	7 8	509	3	510	7
511	8	512	3	513	6	514	5	515	7	516	2	517	4	518	7.8	519	3	520	7

* Setting 3 was changed in this series and the succeeding ones from 3.4.5.**6.7** to 2.3.4.5.**6.7** in order to make the ratio of right doors to wrong doors in the series of ten settings 10:50.

TABLE 5

DAILY SERIES AND AVERAGES WITH RATIOS OF CORRECT TO INCORRECT FIRST CHOICES

PROBLEM 2

Female							Male						
Date	No. of trials	R	W	R	W	Ratio of R to W	Date	No. of trials	R	W	R	W	Ratio of R to W
June							June						
16	1- 5	0	5				16	1- 5	0	5			
"	6-10	0	5	0	10	0:1	"	6-10	0	5	0	10	0:1
17	11-15	2	3				17	11-15	2	3			
"	16-20	0	5				"	16-20	1	4			
"	21-25	0	5	2	13	1:6 50	"	21-25	1	4	4	11	1:2 75
18	26-30	2	3				18	26-30	1	4			
"	31-35	1	4				"	31-35	2	3			
"	36-40	0	5				"	36-40	1	4			
"	41-45	1	4	4	16	1.4 00	"	41-45	1	4	5	15	1 3 00
19	46-50	1	4				19	46-50	1	4			
"	51-55	4	1				"	51-55	2	3			
"	56-60	2	3				"	56-60	1	4			
"	61-65	1	4	8	12	1.1 50	"	61-65	3	2	6	9	1:1 50
20	66-70	1	4				20	66-70	2	3			
"	71-75	2	3				"	71-75	2	3			
"	76-80	0	5				"	76-80	0	5			
"	81-85	2	3	5	15	1.3 00	"	81-85	2	3	6	14	1.2 33
21	86-90	0	5				21	86-90	3	2			
"	91-95	0	5				"	91-95	3	2			
"	96-100	2	3				"	96-100	1	4			
"	101-	1	4	3	17	1.5 67	"	101-	2	3	9	11	1:1 22
22	106-	0	5				22	106-	0	5			
"	111-	2	3				"	111-	2	3			
"	116-	0	5				"	116-	4	1			
"	121-	1	4	3	17	1·5 67	"	121-	1	4	7	13	1:1 86
23	126-	1	4				23	126-	2	3			
"	131-	1	4				"	131-	3	2			
"	136-	2	3				"	136-	2	3			
"	141-	1	4				"	141-	3	2			
"	146-	2	3	7	18	1.2 57	"	146-	5	0	15	10	1. 67
24	151-	1	4				24	151-	2	3			
"	156-	1	4				"	156-	4	1			
"	161-	3	2				"	161-	2	3			
"	166-	3	2				"	166-	5	0			
"	171-	4	1	12	13	1:1 08	"	171-	2	3	15	10	1. 67
25	176-	2	3				25	176-	2	3			
"	181-	3	2				"	181-	4	1			
"	186-	3	2				"	186-	1	4			
"	191-	3	2	11	9	1: 82	"	191-	3	2	10	10	1:1
26	196-	1	4				26	196-	1	4			
"	201-	3	2				"	201-	3	2			
"	206-	2	3	6	9	1:1 50	"	206-	3	2	7	8	1:1 14
27	211-	3	2				27	211-	2	3			
"	216-	2	3				"	216-	2	3			
"	221-	2	3	7	8	1:1 14	"	221-	3	2	7	8	1:1 14
28	226-	2	3				28	226-	2	3			
"	231-	3	2				"	231-	3	2			
"	236-	2	3				"	236-	4	1			
"	241-	5	0				"	241-	2	3			
"	246-	4	1				"	246-	4	1			
"	251-	5	0	21	9	1: 43	"	251-	2	3	17	13	1: 76
29	256-	2	3				29	256-	3	2			

TABLE 5—*Continued*

DAILY SERIES AND AVERAGES WITH RATIOS OF CORRECT TO INCORRECT FIRST CHOICES

PROBLEM 2

Female							Male						
Date	No. of trials	R	W	R	W	Ratio of R to W	Date	No of trials	R	W	R	W	Ratio of R to W
June							June						
29	261–	3	2				29	261–	4	1			
"	266–	4	1				"	266–	4	1			
"	271–	3	2				"	271–	2	3			
"	276–	2	3				"	276–	2	3			
"	281–	4	1	18	12	1. 67	"	281–	4	1	19	11	1 .58
30	286–	4	1				30	286–	1	4			
"	291–	2	3				"	291–	2	3			
"	296–	5	0				"	296–	4	1			
"	301–	2	3	13	7	1: 54	"	301–	3	2	10	10	1:1
July							July						
1	306–	3	2				1	306–	3	2			
"	311–	4	1				"	311–	3	2			
"	316–	5	0				"	316–	3	2			
"	321–	2	3	14	6	1· 43	"	321–	2	3	11	9	1. 82
2	326–	5	0				2	326–	4	1			
"	331–	4	1				"	331–	3	2			
"	336–	4	1				"	336–	4	1			
"	341–	4	1	17	3	1 18	"	341–	2	2	13	7	1. .54
3	346–	5	0				3	346–	2	3			
"	351–	2	3				"	351–	3	2			
"	356–	4	1				"	356–	2	3			
"	361–	3	2	14	6	1 43	"	361–	3	2	10	10	1:1
4	366–	4	1				4	366–	4	1			
"	371–	3	2				"	371–	3	2			
"	376–	4	1				"	376–	3	2			
"	381–	5	0				"	381–	3	2			
"	386–	5	0	21	4	1: 19	"	386–	3	2	16	9	1· 56
							5	391–	5	0			
11	391	4	1				"	396–	2	3			
"	396	5	0	9	1	1: 11	"	401–	3	2			
							"	406–	1	4			
							"	411–	3	2	14	11	1 79
							6	416–	0	5			
							"	421–	4	1	4	6	1.1 50
							7	426–	2	3			
							"	431–	1	4			
							"	436–	3	2			
							"	441–	2	3	8	12	1:1 50
							8	446–	4	1			
							"	451–	3	2			
							"	456–	5	0			
							"	461–	2	3			
							"	466–	4	1	18	7	1: 39
							9	471–	5	0			
							"	476–	1	4			
							"	481–	2	3			
							"	486–	1	4	9	11	1 1 22
							10	491–	3	2			
							"	496–	3	2			
							"	501–	4	1			
							"	506–	2	3	12	8	1: 67
							11	511–	5	0			
							"	516–	4	1	9	1	1· 11

with problem 1. It would then appear to be from four to eight times as difficult as the latter.

One important aspect of the experiment should be here considered. According to our procedure, one of the pigs led and the other followed in a series of trials. It was therefore possible that the follower might be aided in its choice either by watching its companion or by the odor of the box in which the animal fed. There can be no doubt of the tendency of the pigs both to watch one another and to be influenced by the odor of the boxes, but that the solution of the problems did not depend upon either of these factors, although the number of trials necessary to solution may have been modified thereby, is proved by the fact that both subjects made ninety per cent of correct choices when leading.

PROBLEM 3

All of the data in connection with this problem are to be found in tables 6, 7, and 8. The problem is definable as alternately the first mechanism at the right and the first at the left. At the beginning of work on this problem, the animals were given their trials alternately as in the preceding problems, but a strong tendency to follow manifested itself, and on the second day the trials were given by pairs. That is, each individual was allowed to choose in succession the first door at its right and the first door at its left, and was then required to wait while its companion responded to the same pair of settings. Thus, following was rendered impossible.

The tendency to choose the second door from the left naturally manifested itself in the early work on this problem, but it was soon destroyed by training, and the course of experimentation proceeded smoothly to the perfect solution of the problem.

It is to be noted that from the first, ten trials constituted a series. Because of the familiarity with the general experimental situation which the animals had acquired and the experience of the experimenters in the control of hunger and punishment, it was easier to obtain reactions to ten successive trials at this time in the investigation than to five early in the work, with problems 1 or 2.

The female succeeded in solving problem 3 as the result of 420 trials; the male, as the result of 470.

For this problem as for problem 2, the expectation prior to experience is one correct first choice to four incorrect first choices. The male in his first series exhibited exactly this ratio, whereas the female gave a ratio of 1 to 1. Her success, however, was undoubtedly due to following, for in immediately subsequent trials when following was rendered impossible by the giving of the trials by pairs, she did very poorly. The daily ratios for each individual, as presented in table 8, are of interest, but they are by no means as important as are the detailed data of tables 6 and 7

As might have been expected, after the previously acquired tendency to select the first mechanism at the left had been overcome, the pigs shortly exhibited the tendency to select the end boxes, and they then had to overcome the difficulty of selecting the right end. It is quite possible that this task was rendered easier by the rhythm which resulted from the giving of trials by pairs, but it was perfectly evident from control experiments that the animals could choose correctly even if given their trials in rapid succession, without the irregularity due to alternate experimenting with the two individuals.

Since it seemed possible that the animals might have learned the proper settings and be responding to definite situations rather than to the relation of the right box to the other members of the group, a control experiment was made by the presentation of a new series of settings. At the bottoms of tables 6 and 7 appear the results of these control observations.

The female had solved problem 3 on the completion of trial 420 (see tables 6 and 8), and the male on the completion of trial 470 (see tables 7 and 8). The next series of ten trials for each was preliminary to the control experiments and served also as a demonstration series to certain other observers. Following this demonstration in which both pigs reacted fairly well, the series of settings indicated in tables 6 and 7 was presented. Both individuals were somewhat disturbed by the change, her record being seven correct choices out of ten, and his nine out of ten. Later in the day another series of ten trials, according to the original settings, was given with the result that the female made three incorrect first choices in ten and the male two. Still later, the control settings were again presented. This time she chose correctly eight times in ten and he only five times.

TABLE 6

RESULTS FOR FEMALE IN PROBLEM 3

T.	S. 1 **5**.6.7	T.	S. 2 5 6.**7**	T.	S. 3 **1**.2 3 4.5.6	T.	S. 4 1.2.3 4.5.**6**	T.	S. 5 **4**.5.6.7.8	T.	S. 6 4.5 6.7.8	T.	S. 7 **2**.3.4.5	T.	S. 8 2.3.4.**5**	T.	S. 9 **3**.4.5.6 7.8.9	T.	S. 10 3.4.5.6 7.8.**9**
1	7.5	2	6.5.7	3	3.5.4.6 5.3.2 5 4.3.6 5 4.1	4	6	5	4	6	8	7	2	8	3 4.3.5	9	8 7.6.7 5.8.4.7.9 5.8.6 7.3	10	9
11	7.6.5	12	6.7	13	5 6.4 2.3.1	14	5.4.3.6	15	7.5.6.4	16	7 8	17	4.2	18	3.5	19	8.7.6.3	20	4.7.8.9
21	7.6.5	22	5.7	23	2.1	24	3.6	25	8.7 6 5 4	26	8	27	2	28	5	29	9.7.3	30	7.8.7.6.9
31	7.6.7.5	32	5.7	33	4.2.1	34	3 6	35	8 4	36	4.7.5.4.8	37	3.2	38	5	39	8.7.3	40	6.5.8.7.9
41	5	42	5.6.7	43	2.1	44	3.4.6	45	4	46	6.8	47	3.2	48	5	49	9.5.3	50	8.6.3 8.4 9
51	7.6.5	52	5.7	53	2.3.1	54	6	55	8.4	56	6.4 5.7.8	57	2	58	5	59	3	60	7.8 9
61	5	62	7	63	3.2.6 5.1	64	4.6	65	5.7.8.4	66	6 4 6.8	67	2	68	3.5	69	6.9.3	70	4.8.6.9
71	5	72	7	73	5.3.1	74	6	75	8 4	76	7.8	77	2	78	3.5	79	9.3	80	8.9
81	5	82	5.7	83	6.1	84	3.5.6	85	8.5 8.5.4	86	7.8	87	2	88	3 5	89	9.3	90	7.9
91	6.7.5	92	6.7	93	2.6.4 5.6.1	94	3.6	95	6.8.4	96	7.4.8	97	2	98	5	99	7.9.8.9.3	100	7.8.9
101	5	102	7	103	2.5.6.1	104	4.6	105	6.8 4	106	6.8	107	2	108	5	109	8.9.6 9 7.9 3	110	3 7.8.9
111	7.5	112	6.7	113	1	114	3.6	115	8.7.4	116	8	117	5.3.2	118	5	119	7.8.9.3	120	7.9
121	7.5	122	7	123	2.6.1	124	4.1.3.6	125	8.4	126	6.8	127	2	128	5	129	8.9.3	130	8.9
131	6.7.5	132	7	133	1	134	6	135	7.8.4	136	6.8	137	2	138	5	139	9.8.9.3	140	7.9
141	5	142	7	143	1	144	3.6	145	8 4	146	7.8	147	2	148	5	149	3	150	8.9
151	6.7.5	152	7	153	1	154	3.6	155	7.8.4	156	6.8	157	2	158	5	159	9 3	160	9
161	7.5	162	6.7	163	1	164	3.4.6	165	4	166	8	167	2	168	3.5	169	8.3	170	7.9
171	5	172	7	173	1	174	3.6	175	8 4	176	7.8	177	2	178	5	179	9.8.3	180	9
181	6.5	182	7	183	2.4.6.1	184	3.1.6	185	4	186	8	187	2	188	3.2.5	189	9.3	190	6.9
191	5	192	7	193	2 4.6 1	194	3.6	195	8.4	196	7.8	197	3.5 2	198	5	199	9.3	200	6.9
201	5	202	7	203	2.6.1	204	6	205	8.4	206	6.8	207	2	208	5	209	9 3	210	9

211	6.7.5	212	7	213	6.1	214	6	215	7.8.5 7.8.4	216	8	217	3.5.2	218	5	219	9.3	220	9
221	5	222	7	223	2.6.1	224	6	225	4	226	8	227	2	228	5	229	9.3	230	9
231	5	232	7	233	2.1	234	6	235	4	236	7.5 4.8	237	2	238	3.5	239	3	240	9
241	5	242	5.7	243	1	244	6	245	4	246	8	247	2	248	5	249	3	250	9
251	5	252	7	253	1	254	2.6	255	4	256	8	257	2	258	3.5	259	3	260	9
261	5	262	7	263	1	264	6	265	4	266	8	267	2	268	5	269	9.3	270	9
271	5	272	7	273	1	274	3.6	275	4	276	8	277	2	278	4.5	279	3	280	9
281	5	282	5.7	283	1	284	3.6	285	8.4	286	8	287	2	288	5	289	3	290	9
291	5	292	7	293	1	294	3 6	295	8 4	296	8	297	2	298	5	299	9.3	300	9
301	5	302	7	303	1	304	6	305	8.4	306	7.8	307	2	308	3 5	309	3	310	9
311	5	312	7	313	1	314	6	315	8.4	316	8	317	2	318	5	319	3	320	9
321	7.5	322	7	323	1	324	5.6	325	4	326	8	327	2	328	4 5	329	9.3	330	9
331	5	332	7	333	1	334	6	335	4	336	8	337	2	338	3 5	339	3	340	9
341	6.5	342	7	343	2.1	344	6	345	4	346	8	347	2	348	5	349	9.3	350	8.9
351	5	352	7	353	1	354	3.6	355	4	356	8	357	2	358	5	359	3	360	9
361	5	362	7	363	1	364	6	365	4	366	8	367	2	368	5	369	9.3	370	9
371	6.5	372	7	373	1	374	6	375	4	376	8	377	2	378	5	379	3	380	9
381	5	382	7	383	1	384	4.6	385	4	386	8	387	2	388	4.5	389	9.3	390	9
391	5	392	7	393	1	394	6	395	8.4	396	8	397	2	398	5	399	3	400	9
401	6.5	402	7	403	2.1	404	6	405	4	406	8	407	2	408	5	409	3	410	9
411	5	412	7	413	1	414	6	415	4	416	8	417	2	418	5	419	3	420	9
421	5	422	6.7	423	1	424	6	425	5.4	426	7.8	427	2	428	5	429	3	430	9
	3.4.5.6		3.4.5.**6**		**4**.5 6 7.8 9		4.5 6 7.8.**9**		**1**.2.3.4 5		1.2.3.4.**5**		**2**.3.4 5.6.7		2.3.4 5.6.**7**		**3**.4 5 6.7.8		3.4.5 6.7.**8**
1	4.6.3	2	6	3	4	4	9	5	2 1	6	5	7	7.2	8	7	9	3	10	8
431	5	432	7	433	1	434	6	435	6.8.4	436	7.8	437	2	438	5	439	9.3	440	9
	3.4.5.6		3.4.5.**6**		**4**.5.6 7.8 9		4.5.6 7.8.**9**		**1**.2 3.4.5		1.2 3.4.**5**		**2**.3.4 5.6.7		2.3.4 5.6.**7**		**3**.4.5 6.7.8		3.4.5 6.7.**8**
11	3	12	6	13	5.9 4	14	9	15	1	16	5	17	2	18	7	19	5.3	20	8

TABLE 7

RESULTS FOR MALE IN PROBLEM 3

T.	S. 1	T.	S. 2	T.	S. 3	T.	S. 4	T.	S. 5	T.	S. 6	T.	S. 7	T.	S. 8	T.	S. 9	T.	S. 10
	5.6.7		5.6.**7**		**1**.2.3 4.5.6		1.2.3 4.5.**6**		**4**.5.6.7.8		4.5 6.7.**8**		**2**.3.4 5		2.3.4 **5**		**3**.4.5 6 7.8.9		3.4.5.6 7 8.**9**
1	6.5	2	7	3	5.4.3.2 6.5.3 4.2.5 3.5.1	4	1.3.5.5.6	5	7.6.4	6	7.6.8	7	5.4.3.2	8	5	9	8.7.6.8 7.7.3	10	5.7.8.9
11	6.5	12	6.7	13	2.1	14	5.4.3.6	15	7.8.5.4	16	8	17	2	18	5	19	3	20	8.7.9
21	6.5	22	7	23	5.4.3.2 6.5.1	24	3.2.6	25	8.7.4	26	6.8	27	3.5.2	28	3.5	29	8.7.9 8.6.3	30	8.7.5 4.8.9
31	7.6.5	32	7	33	5.4.3.2.1	34	5.4.3.5.6	35	8.6 8.7.4	36	8	37	3.2	38	2 5	39	7 6 9 8 7.3 9 7.6 8	40	8.9
41	7.6.5	42	7	43	5.3.2.4.1	44	5.2.1.4.6	45	7.8.6.7.4	46	8	47	5 2	48	2.4.3 2.5	49	9.8 5.4 8.7.4.6 8 3	50	9
51	6.7.5	52	5.7	53	3.1	54	2 5.6	55	8.6.4	56	8	57	3.5.2	58	4 5	59	9.8 3	60	6.3.8 7 9
61	7.5	62	6.5.7	63	3.1	64	2.6	65	7.8 7.4	66	8	67	4.2	68	3.5	69	9.3	70	7.9
71	7.5	72	6.7	73	5.1	74	2.1.4 2.6	75	4	76	6.8	77	5.2	78	3 5	79	9.5.3	80	9
81	7.5	82	6.7	83	1	84	3.4.6	85	8.7.8.4	86	7.8	87	2	88	3.5	89	9.3	90	9
91	6.5	92	7	93	3.1	94	6	95	8.4	96	8	97	3.5.2	98	5	99	9.4 8.9 4.8.9.3	100	6.9
101	5	102	7	103	4.1	104	6	105	8 5 8 6.8.4	106	5.8	107	3.2	108	5	109	9.3	110	8.9
111	7.5	112	6.7	113	3 1	114	4.6	115	8.4	116	8	117	3 5.2	118	5	119	9.3	120	9
121	6.7.5	122	6.7	123	3.1	124	5.1.6	125	6.4	126	8	127	3.2	128	5	129	9.3	130	9
131	7.5	132	7	133	3.1	134	6	135	8.4	136	7.8	137	2	138	5	139	8.9.3	140	9
141	6.5	142	7	143	1	144	3.4.3.2.6	145	4	146	8	147	2	148	3.5	149	4.9.7.4 9.5.8.3	150	9
151	7.5	152	7	153	2.6.4.2.1	154	2.5 3.6	155	8.4	156	8	157	3.2	158	3.5	159	9.3	160	9
161	6.5	162	7	163	2.6.4.6 2.6 1	164	3.2.6	165	8.5.4	166	8	167	3.5.2	168	5	169	9.3	170	9
171	7.5	172	7	173	1	174	3.5.3.2.6	175	4	176	7.8	177	2	178	3.5	179	3	180	9
181	5	182	7	183	2.6.1	184	3.6	185	8.4	186	8	187	2	188	3.5	189	3	190	9
191	5	192	7	193	1	194	2.6	195	7.5.4	196	8	197	2	198	3.5	199	9.3	200	9
201	7.5	202	7	203	3.1	204	6	205	4	206	8	207	2	208	2.5	209	9.3	210	9

211	7.5	212	7	213	2.6.1	214	3.6	215	8.6.4	216	8	217	2	218	5	219	9.3	220	9
221	5	222	7	223	2.6 1	224	2.1.6	225	4	226	8	227	3.2	228	2.5	229	9.3	230	9
231	6.5	232	7	233	1	234	2.2.6	235	7.4	236	8	237	2	238	3.5	239	9.3	240	9
241	7.5	242	7	243	2.6.4.1	244	5.2.6	245	4	246	8	247	3.5.2	248	3.5	249	3	250	9
251	6.5	252	7	253	1	254	3.6	255	8.4	256	8	257	2	258	3.5	259	3	260	9
261	7.5	262	7	263	3.5.1	264	6	265	4	266	8	267	2	268	4.5	269	9.3	270	9
271	5	272	7	273	1	274	6	275	4	276	8	277	2	278	3.5	279	3	280	9
281	5	282	7	283	1	284	3.6	285	4	286	8	287	2	288	5	289	3	290	9
291	7.5	292	7	293	2.3.1	294	6	295	4	296	8	297	2	298	4.5	299	3	300	9
301	7.5	302	7	303	1	304	6	305	4	306	8	307	2	308	5	309	9.3	310	9
311	6 5	312	7	313	2.5.6.1	314	6	315	4	316	8	317	2	318	5	319	9.3	320	9
321	5	322	7	323	1	324	6	325	8.4	326	8	327	2	328	5	329	9.3	330	9
331	5	332	7	333	1	334	5.4.6	335	4	336	8	337	2	338	5	339	3	340	9
341	7.5	342	7	343	2.6.1	344	6	345	4	346	8	347	2	348	5	349	3	350	9
351	7.5	352	7	353	1	354	4.6	355	4	356	8	357	3.5.2	358	5	359	3	360	9
361	6.5	362	5.7	363	1	364	2.6	365	4	366	8	367	2	368	3.5	369	3	370	9
371	5	372	7	373	1	374	6	375	4	376	8	377	2	378	5	379	9.3	380	9
381	7.5	382	7	383	2.1	384	6	385	4	386	8	387	2	388	5	389	3	389	9
391	5	392	7	393	2.4.6.1	394	6	395	4	396	8	397	2	398	5	399	3	400	9
410	5	402	7	403	1	404	4.3.6	405	4	406	8	407	2	408	3.5	409	3	410	9
411	5	412	7	413	1	414	4.2.6	415	4	416	8	417	2	418	5	419	3	420	8.3.9
421	5	422	7	423	2.6.1	424	6	425	8.4	426	8	427	2	428	5	429	3	430	9
431	5	432	7	433	6.1	434	6	435	4	436	8	437	2	438	4.5	439	3	440	9
441	5	442	6.7	443	1	444	6	445	5.8.1	446	8	447	2	448	5	449	3	450	9
451	5	452	7	453	1	454	6	455	7.4	456	8	457	3.5.2	458	4.5	459	9.3	460	9
461	5	462	7	463	1	464	6	465	4	466	8	467	2	468	5	469	3	470	9
471	7.5	472	7	473	1	474	6	475	8 4	476	8	477	2	478	5	479	3	480	9
	3.4.5.6		3 4.5.**6**		**4**.5.6 7.8 9		4.5.6 7.8 **9**		**1**.2 3.4.5		1.2.3.4.**5**		**2**.3.4 5.6.7		2 3.4 5 6.**7**		**3**.4.5 6.7.8		3.4.5 6.7.**8**
1	3	2	6	3	4	4	9	5	1	6	5	7	2	8	7	9	4.3	10	8
481	6.5	482	7	483	2.6.1	484	6	485	4	486	8	487	2	488	5	489	3	490	9
	3.4.5.6		3.4.5.**6**		**4**.5.6 7.8.9		4.5.6 7.8.**9**		**1**.2.3.4.5		1.2.3.4.**5**		**2**.3.4 5 6 7		2 3.4 5.6.**7**		**3**.4.5 6.7.8		3.4.5 6.7.**8**
11	5.3	12	6	13	5.4	14	9	15	2.5.1	16	5	17	5.2	18	7	19	7.3	20	8

TABLE 8

DAILY SERIES AND AVERAGES WITH RATIOS OF CORRECT TO INCORRECT FIRST CHOICES

PROBLEM 3

Female							Male						
Date	No. of trials	R	W	R	W	Ratio of R to W	Date	No. of trials	R	W	R	W	Ratio of R to W
July 11	1–	5	5	5	5	1:1	July 11	1–	2	8	2	8	1:4 00
12	11–	0	10				12	11–	4	6			
"	21–	3	7	3	17	1:5 66	"	21–	1	9	5	15	1:3.00
13	31–	1	9				13	31–	2	8			
"	41–	3	7	4	16	1:4 00	"	41–	3	7	5	15	1:3.00
14	51–	4	6				14	51–	1	9			
"	61–	3	7	7	13	1:1 86	"	61–	1	9	2	18	1:9 00
15	71–	4	6				15	71–	2	8			
"	81–	2	8	6	14	1:2 33	"	81–	3	7	5	15	1:3.00
16	91–	2	8				16	91–	4	6			
"	101–	4	6	6	14	1:2 33	"	101–	4	6	8	12	1:1 50
17	111–	3	7				17	111–	3	7			
"	121–	3	7	6	14	1.2.33	"	121–	3	7	6	14	1:2 33
18	131–	5	5				18	131–	5	5			
"	141–	6	4				"	141–	6	4			
"	151–	5	5	16	14	1: 88	"	151–	3	7	14	16	1:1.14
19	161–	4	6				19	161–	4	6			
"	171–	6	4	10	10	1:1	"	171–	6	4	10	10	1:1
20	181–	4	6				20	181–	6	4			
"	191–	3	7	7	13	1:1 86	"	191–	6	4	12	8	1: 67
21	201–	6	4				21	201–	6	4			
"	211–	5	5	11	9	1: 82	"	211–	5	5	11	9	1: .82
22	221–	8	2				22	221–	5	5			
"	231–	7	3	15	5	1· 33	"	231–	5	5	10	10	1:1
23	241–	9	1				23	241–	5	5			
"	251–	8	2	17	3	1: .18	"	251–	6	4	11	9	1: .82
24	261–	9	1				24	261–	6	4			
"	271–	8	2				"	271–	9	1			
"	281–	7	3	24	6	1: 25	"	281–	9	1	24	6	1: 25
25	291–	7	3				25	291–	7	3			
"	301–	7	3				"	301–	8	2			
"	311–	9	1	23	7	1: 30	"	311–	7	3	22	8	1: 36
26	321–	6	4				26	321–	8	2			
"	331–	9	1	15	5	1: 33	"	331–	9	1	17	3	1: .18
27	341–	6	4				27	341–	8	2			
"	351–	9	1	15	5	1: 33	"	351–	7	3	15	5	1: 33
28	361–	9	1				28	361–	6	4			
"	371–	9	1	18	2	1: 11	"	371–	9	1	15	5	1· 33
29	381–	7	3				29	381–	8	2			
"	391–	9	1	16	4	1: 25	"	391–	9	1	17	3	1: .18
30	401–	8	2				30	401–	8	2			
"	411–	10	0	18	2	1: 11	"	411–	8	2	16	4	1. 25
							31	421–	8	2			
							"	431–	8	2	16	4	1. .25
							Aug. 1	441–	8	2			
							"	451–	6	4			
							"	461–	10	0	24	6	1: 25
2	421	7	3	7	3	1: 43	2	471	8	2	8	2	1: .25
3	1-10	7	3	7	3	1: 43	3	1-10	9	1	9	1	1: .11
3	431	7	3	7	3	1: .43	3	481	8	2	8	2	1: .25
3	11-20	8	2	8	2	1: 25	3	11-20	5	5	5	5	1:1

Although these figures are far from conclusive, we are convinced from the behavior of the animals that neither was choosing by familiarity with the particular settings. She, as has been pointed out, did as well with the control series as with the regular series, and he did even better in the first control series than in the regular series, while showing extreme confusion in the second control series. This was doubtless due to insufficient hunger and the distracting influence of a mistake in the first trial of the series. His carelessness throughout the last control series was conspicuous.

Comparison of the results for problems 2 and 3 indicate that for the female problem 3 was somewhat the more difficult, whereas for the male, problem 2 required a larger number of trials. We are by no means convinced by this comparison that the problems have not been used in the order of increasing difficultness, for we consider the female subject a much more reliable individual than the male, and we suspect that his greater facility in the solution of the third problem was due in part, at least, to the experience of the experimenters in dealing with his temperamental and other peculiarities.

PROBLEM 4

The data to be considered in this connection appear in tables 9, 10 and 11. The correct mechanism is definable simply as the middle one, and the expectation prior to experience is one correct to four incorrect first choices, since the total number of doors open in the series of ten settings is fifty. As is shown in table 11, precisely this ratio resulted from the first day's experimentation in the case of each individual.

Ten trials per series were given regularly throughout the work on this problem.

Unlike the preceding problems, this one proved insoluble. Consequently, the detailed results as they appear in tables 9 and 10 are especially important, since from them may be read the reactive tendencies and their relations to one another. It is, of course, easy to understand why the ratio of correct to incorrect first choices should change steadily in the direction of the solution of the problem, for each subject gradually learned to react appropriately to certain of the settings while failing to acquire the ability to react to the relation middleness.

TABLE 9

RESULTS FOR FEMALE IN PROBLEM 4

T.	S. 1	T.	S. 2	T.	S. 3	T.	S. 4	T.	S. 5	T.	S. 6	T.	S. 7	T.	S. 8	T.	S. 9	T.	S.10
	2.3.4		5.6.7.8.9		1.2.3.4 5.6 7		7.8.9		4.5.6.7.8		1 2.3.4 5 6.7.8 9		1.2.3		2.3.4.5.6		3.4.5.6 7.8.9		6.7.8
1	2.3	2	5.9.5.9 6.5.9.9 5.9.8.9 5.9.8.6 7	3	1.7.4	4	7.9.7.8	5	4.8.4.8.6	6	1.9.5	7	1.3.2	8	2.5.6 2.6.3 6.5.4	9	3.9.5 9.3.8 9.3.6	10	6.8.7
11	3.4.3	12	5.8.9 6.5.9 6.8.7	13	1.7.3.6 1.5.3.7 2.1.6.5 2.7.5.6 4	14	9.8	15	6	16	5	17	2	18	6.3.5.6 2.3 6.5 3.6 2.4	19	3 8.9.6	20	7
21	2.4.4.3	22	5.8.7	23	1.6.4	24	7.8	25	6	26	1.8.5	27	1.2	28	5.4	29	5.8.3 9.7.6	30	7
31	2.4 3	32	7	33	3.4	34	9.7.8	35	5.6	36	5	37	3 2	38	3.6.4	39	6	40	8.7
41	2.3	42	5.7	43	6.3.4	44	8	45	6	46	2.7 9.1 4.2.9.5	47	3.2	48	5 4	49	6	50	6.8 7
51	2.4.3	52	7	53	5.1.6.7 5.6.2 4 5.3.6 1	54	7.8	55	6	56	1.9.7.3.5	57	2	58	6.3.5 7.2.4	59	3.6	60	7
61	2.4.3	62	8.6.5 7	63	2.7.5.2 6.1.4	64	8	65	5.6	66	6.7.9 3.2 5	67	2	68	6.3.4	69	3.6	70	6.8.6.8.7
71	4.2.3	72	8.5.9.6 7	73	5.6.2.5 1.7.4	74	9.8	75	5.6	76	5	77	2	78	4	79	7 8.3 7 8.3.5.6	80	7
81	3	82	7	83	2.6.4	84	8	85	5 4 6	86	2.6.4.5	87	2	88	6.3 4	89	7 8.5.6	90	6.7
91	4.2.3	92	6 8.6.7	93	2.6.5 4	94	8	95	5.7.5.6	96	6.7.2.9 2 4 6.5	97	2	98	6 4	99	7 6	100	8.6.8.7
101	4.2.3	102	5.6.7	103	5.4	104	7 8	105	6	106	2 4.6 7.5	107	2	108	6.5.4	109	8.7.6	110	.87
111	2.3	112	8.6.7	113	2 5.4	114	8	115	5 6	116	2.4.5	117	2	118	6.6.5.4	119	6	120	6.7
121	3	122	8.6.7	123	2.5 6.4	124	7.8	125	5 6	126	1.4.3 5	127	2	128	4	129	3.6	130	7
131	3	132	7	133	4	134	8	135	6	136	5	137	2	138	6.5.6.4	139	6	140	8 7
141	4.3	142	7	143	2.5.6.5 6 1.4	144	8	145	7.6	146	6.5	147	2	148	6.4	149	8.9.6	150	8.7
151	3	152	7	153	2 5.6 7 5.2.4	154	8	155	7.6	156	7 8.4 8.8.5	157	2	158	5.3.6.4	159	8.7.3.7 8.4.6	160	6.8.7
161	2 4 3	162	7	163	4	164	8	165	6	166	2.5	167	2	168	3 4	169	8.7.4.6	170	7
171	3	172	5.7	173	2.4	174	8	175	5.6	176	2.3.5	177	2	178	3 4	179	6	180	7
181	3	182	8.7	183	2.4	184	7.8	185	5 7.6	186	2 4 7.8 5	187	2	188	4	189	8 7.6	190	8.7
191	3	192	6.7	193	2 4	194	7.8	195	5 6	196	2.4 8 4.5	197	2	198	6 3 4	199	6	200	7
201	3	202	7	203	5.4	204	7.8	205	5.6	206	2.4.5	207	2	208	4	209	6	210	6.8.7
211	3	212	6.8.5.7	213	5.4	214	7.8	215	6	216	4.6 2 5	217	2	218	6 4	219	8.7.6	220	6.7
221	3	222	6 8 5.7	223	5.6.4	224	8	225	5.6	226	5	227	2	228	6.4	229	8.7.5.6	230	7

231	3	232	7	233	4	234	8	235	6	236	2.1.5	237	2	238	6.5.3.4	239	6	240	7
241	3	242	6.8.7	243	4	244	8	245	5.6	246	2.4.6 8.9.5	247	3.2	248	6.5.4	249	8.9.5.7.6	250	8.7
251	4.3	252	7	253	4	254	8	255	5 6	256	2.4.5	257	3.2	258	3.4	259	4.5 6	260	7
261	3	262	7	263	4	264	8	265	7.6	266	5	267	2	268	5 4	269	6	270	7
271	4.3	272	8.7	273	6.5.7.4	274	8	275	6	276	4 6 2.6 8.6.4.7 4.3.2 4 6.7.5	277	3.2	278	5.4	279	6	280	7
281	4.3	282	7	283	6.4	284	8	285	6	286	2 6.4.5	287	2	288	5.4	289	6	290	7
291	4.3	292	8.6.7	293	5.6.4	294	8	295	6	296	4.6.5	297	3 2	298	6 5.4	299	7.6	300	7
301	3	302	6.7	303	4	304	7.8	305	6	306	7 5	307	3 2	308	6 5.4	309	7 8 7 6	310	8.7
311	3	312	6.5.7	313	5.6.4	314	8	315	5 6	316	4 7.6.2 4.3.5	317	3.2	318	4	319	4.7.6	320	8.6.7
321	4.3	322	6.8.7	323	7 6.2 4	324	8	325	7 5.6	326	2.4.3.5	327	2	328	6.4	329	8 6	330	7
331	3	332	6.7	333	4	334	8	335	4.5.6	336	2.4 5	337	2	338	6 4	339	6	340	7
341	4.3	342	7	343	2.4	344	8	345	4 6	346	2 4.6 7 3.5	347	2	348	6.4	349	8.4.6	350	7
351	3	352	6 6 8.7	353	5.6 4	354	8	355	5.6	356	6 7 5	357	2	358	4	359	8 7.6	360	8 7
361	4.3	362	6.8 5 7	363	4	364	7.8	365	5.6	366	5	367	2	368	6.5 4	369	8 7.5 6	370	7
371	4.3	372	7	373	5 6.4	374	8	375	7.6	376	7 8.6 1 5	377	2	378	6.4	379	7.6	380	7
381	4.3	382	8 7	383	6 5.4	384	8	385	6	386	5	387	2	388	6 5 4	389	7 6	390	7
391	3	392	8.7	393	5.6 4	394	8	395	5 .6	396	6 5	397	2	398	5 4	399	6	400	7
401	3	402	7	403	5.6.4	404	8	405	4 5 6	406	2.4 5	407	2	408	4	409	6	410	7
411	3	412	7	413	2 4	414	8	415	5.6	416	2 4 5	417	2	418	3.4	419	6	420	7
421	3	422	6.7	423	4	424	8	425	6	426	2.5	427	2	428	2 4	429	6	430	7
431	3	432	6 7	433	2 6.5 4	434	8	435	4.5.6	436	2 4.5	437	2	438	3.4	439	6	440	8.7
441	3	442	8.7	443	2 4	444	8	445	6	446	6 6 2 4.6 5	447	2	448	6 4	449	6	450	7
451	4.3	452	8 7	453	2 4	454	8	455	7.6	456	2 4 5	457	3.2	458	6.4	459	8.7.6	460	7
461	3	462	7	463	2.4	464	8	465	6	466	2 5	467	2	468	6 4	469	6	470	7
471	3	472	7	473	3.4	474	8	475	7.6	476	2.4 5	477	2	478	4	479	4 6	480	7
481	3	482	7	483	3.5.4	484	8	485	6	486	4.5	487	2	488	4	489	4 5.4.5 6	490	8.7
491	3	492	7	493	5.4	494	8	495	6	496	2.5	497	2	498	4	499	6	500	8.7
501	3	502	8.7	503	6.5.4	504	8	505	7.5.6	506	2.5	507	2	508	6 4	509	7.6	510	7
511	3	512	8.7	513	2 5.6.4	514	8	515	7.6	516	2 5	517	2	518	5.6 4	519	8 7.6	520	7
521	3	522	6 7	523	4	524	8	525	6	526	2.4 5	527	2	528	6 5.4	529	6	530	8.7
531	3	532	7	533	4	534	8	535	7.6	536	5	537	2	538	6.5.4	539	7.6	540	7
541	3	542	8.7	543	4	544	8	545	7.6	546	2.5	547	2	548	6.5.4	549	8 6	550	7
551	4.3	552	8.7	553	6.4	554	8	555	7.6	556	7 4.5	557	2	558	5.4	559	6	560	7
561	4 3	562	8.7	563	4	564	8	565	6	566	5	567	2	568	6 5.4	569	7.6	570	7
571	3	572	8 7	573	4	574	8	575	6	576	4 5	577	2	578	4	579	7 6	580	7
581	3	582	7	583	6.5 4	584	8	585	7 6	586	6 5	587	2	588	6 5.4	589	7.6	590	7
591	3	592	6 7	593	4	594	7.7.8	595	5 6	596	2.3 4.5	597	2	598	3.5.4	599	5 6	600	7

TABLE 9—*Continued*

RESULTS FOR FEMALE IN PROBLEM 4

T.	S. 1 2.3.4	T.	S. 2 5.6.7.8 9	T.	S. 3 3.4.5.6.7	T.	S. 4 7.8.9	T.	S. 5 4 5.6.7.8	T.	S. 6 1.2.3.4.5	T.	S. 7 1.2.3	T.	S. 8 2.3.4.5.6	T.	S. 9 4.5.6	T.	S 10 6.7.8
1	3	2	7	3	4.5	4	7.8	5	6	6	2.4.3	7	2	8	4	9	5	10	7
11	3	12	7	13	6 5	14	8	15	6	16	5.4.2 5 4.3	17	2	18	4	19	6.5	20	7
21	3	22	8.7	23	4.5	24	8	25	6	26	2 4.5.2 4.5.4.3	27	2	28	4	29	5	30	7
31	3	32	7	33	7.6.5	34	8	35	7.6	36	2.4.5.4 4 2.4 3	37	2	38	5.4	39	5	40	7
41	3	42	7	43	6.5	44	7.8	45	7.6	46	2.4.3	47	2	48	4	49	5	50	7
51	3	52	6.7	53	4.5	54	8	55	6	56	4.5.4.2 3	57	2	58	5.6.4	59	6 5	60	7
61	3	62	7	63	4 5	64	8	65	6	66	2.4.3	67	2	68	5.4	69	6.5	70	8.7
71	3	72	7	73	4 5	74	7.8	75	6	76	4.2.3	77	2	78	4	79	6.5	80	8.6.7
81	3	82	7	83	4.6.5	84	7 8	85	5.4.6	86	2 4.3	87	2	88	4	89	6.5	90	7
91	3	92	7	93	6.5	94	8	95	4.6	96	2 3	97	2	98	4	99	5	100	7
101	3	102	7	103	6.5	104	8	105	6	106	2.4.5.2.3	107	3.2	108	4	109	6.5	110	8.7
111	3	112	7	113	6.5	114	8	115	6	116	2.4.3	117	2	118	5.4	119	5	120	8.7
121	3	122	8.7	123	5	124	8	125	6	126	4.3	127	2	128	4	129	6.5	130	7
131	3	132	7	133	6 5	134	7.8	135	6	136	4 3	137	2	138	6.5 4	139	6.5	140	7
141	4.3	142	7	143	6.5	144	8	145	6	146	2.4.5.3	147	2	148	5.4	149	6.5	150	7
151	3	152	7	153	5	154	8	155	7.6	156	4.3	157	2	158	5.6 4	159	6.5	160	8 7
161	3	162	7	163	6.5	164	8	165	6	166	4.3	167	3.2	168	5.4	169	5	170	8.7
171	3	172	7	173	5	174	8	175	6	176	2.3	177	2	178	4	179	5	180	7
181	3	182	7	183	6.5	184	8	185	6	186	2.4.3	187	2	188	4	189	4.6.5	190	8.7
191	3	192	6.5 8 7	193	4.3.5	194	8	195	6	196	3	197	2	198	6.3.4	199	5	200	7
201	3	202	8.7	203	6.4 5	204	8	205	6	206	4.3	207	2	208	5 4	209	6.5	210	7

TABLE 10

RESULTS FOR MALE IN PROBLEM 4

T.	S. 1	T.	S. 2	T.	S. 3	T.	S. 4	T.	S. 5	T.	S. 6	T.	S. 7	T.	S. 8	T.	S. 9	T.	S. 10
	2.3.4		5.6.7.8.9		1.2.3 **4** 5.6 7		7.8.9		4.5.6.7.8		1.2.3 4.5 6.7.8 9		1.2.3		2.3.4.5 6		3.4.5.6 7.8.9		6.7.8
1	2 4.2.4 3	2	5.9.5.9.7	3	1.7.1.7.4	4	7.9.7 9.7.8	5	4.8.7.8 4.8.4.7 4.8.5.7 4.8.5.8 6	6	1.9.2 8.6.5	7	1.3.2	8	2.6.5.4	9	3.9.5 8 3.9.6	10	7
11	2.4 3	12	5.8.6.9.7	13	1.6.5.7 2.3.5 1 7.4	14	8	15	5 7 4 6	16	2 6.3.9 1.4 5	17	2	18	3 2.5.6.4	19	8.3.5.9.6	20	7
21	2.3	22	6.5 8.9.7	23	5.1.4	24	8	25	4.5.7 4.6	26	1.3 2 4 1.9 7 5	27	2	28	6.5.4	29	5.3.8.6	30	6.8.6.7
31	2.4.3	32	5.8.9.6.7	33	5 1.6.4	34	8	35	5.7.6	36	2 8.6 4.2.5	37	3.1.2	38	3.5.6.5.4	39	3.6	40	7
41	2.3	42	6.5.8.9 7	43	4	44	8	45	6	46	2 5	47	1.2	48	3.2.6 5 3.6.5 6.2.4	49	8.3.8.7.6	50	7
51	2 3	52	7	53	1.7.4	54	8	55	5.6	56	2 6.1.4 3.2.5	57	2	58	2.5.4	59	3 6	60	7
61	3	62	8.6.5.7	63	5 2 1.6 5 7 3 4	64	7.8	65	7 4.5 6	66	3.9.5	67	2	68	3.4	69	7.9.8 5.9.8 7.3.6	70	8.7
71	3	72	8.6 5.5.7	73	6.5.2.4	74	8	75	5.4.5 6	76	2.3.7.7 8.2.3 8 4.6.7.2 5	77	3.2	78	6.4	79	8.7.9.6	80	7
81	4.3	82	9.7	83	2.4	84	8	85	6	86	5	87	2	88	6.5.3.4	89	7.3 6	90	8.7
91	2 4.3	92	6 8 6 5.7	93	6.2.4	91	8	95	7 5 4.6	96	5	97	2	98	5.6.4	99	6	100	7
101	2.4.3	102	7	103	1.4	104	7.8	105	5 6	106	7.3.5	107	2	108	4	109	6	110	7
111	3	112	8.6 5.7	113	5.6 2.7.4	114	7.8	115	6	116	7.5	117	2	118	5.6 4	119	5.8.7.6	120	8.7
121	3	122	6.5.8 6 7	123	2.4	124	8	125	5.7.4 7 6	126	2 3.6.1.5	127	2	128	3.4	129	8.6	130	8.7
131	3	132	5.7	133	2.4	134	8	135	6	136	2 6 7.5	137	2	138	6.5.4	139	8.7 6	140	8.7
141	4.2.3	142	7	143	2.5.7 6.4	144	8	145	6	146	6 5	147	2	148	6.4	149	8.7.6	150	8 7
151	2 4.3	152	6.7	153	1.6.4	154	8	155	5.6	156	7.2 5	157	2	158	6 2.6.4	159	6	160	8.7
161	2.4 3	162	8.6.7	163	2.4	164	8	165	6	166	2.4.2.6.5	167	2	168	6.5.4	169	7.6	170	8.7
171	3	172	8.7	173	7 6.5 6.2.4	174	8	175	5.7.5.6	176	5	177	2	178	5.6.5.4	179	6	180	8.7
181	3	182	8.6.5.7	183	5 2.4	184	8	185	6	186	2.5	187	2	188	2 4	189	3.7.5.6	190	8.7
191	3	192	7	193	2.4	194	8	195	5.6	196	6.2.4 5	197	2	198	5 4	199	6	200	7
210	3	202	7	203	2.4	204	8	205	5.6	206	2 5	207	2	208	4	209	8.7 6	210	8.6.7
211	2 4.3	312	6 7	213	2.5.7.4	214	8	215	6	216	2 6 4.3.5	217	2	218	6.4	219	8 7.6	220	8.7
221	3	222	6.5.6.8.7	223	2.4	224	8	225	6	226	2.3.4.5	227	2	228	3.4	229	7.6	230	8.7

TABLE 10

RESULTS FOR MALE IN PROBLEM 4

T.	S. 1	T.	S. 2	T.	S. 3	T.	S. 4	T.	S. 5	T.	S. 6	T.	S. 7	T.	S. 8	T.	S. 9	T.	S. 10
	2 3.4		5.6.7 8.9		1.2.3.4 5 6 7		7.8 9		4 5.6 7.8		1 2.3 4.5 6.7 8 9		1.2 3		2 3 4.5.6		3.4.5 6 7.8.9		6.7.8
231	3	232	8.7	233	5 6.7.4	234	8	235	7.6	236	2.5	237	2	238	6.5.6.4	239	8.7 5 7 6	240	7
241	3	242	8.7	243	2.4	244	8	245	5.6	246	2.4.7 2 4 5	247	2	248	3.5 6.4	249	6	250	7
251	3	252	8.6.5.6.7	253	2.6.3.4	254	8	255	6	256	2 5	257	2	258	3.4	259	3 5 6	260	7
261	3	262	7	263	5 4	264	7.8	265	5.6	266	2.5	267	2	268	5 6 4	269	6	270	7
271	2.4.3	272	6.6.7	273	2 3.5 4	274	8	275	4.6	276	6 7.3.4 5	277	3.2	278	4	279	6	280	8.7
281	3	282	6.5.7	283	2.4	284	8	285	5.4.6	286	2.3 5	287	2	288	4	289	5.7.6	290	8.7
291	3	292	8.7	293	5 6 4	294	8	295	6	296	7.7 2 6 5	297	2	298	5 6 6.4	299	7.6	300	7
301	3	302	8 6.7	303	5.6.4	304	8	305	6	306	2.6 5	307	2	308	5 6.2.6.4	309	6	310	8 6 7
311	3	312	7	313	2 4	314	7.8	315	5.7 6	316	8.5	317	2	318	6 4	319	8.7.6	320	8 7
321	3	322	6.8.7	323	5 6.5 7.6.4	324	8	325	7 5.4.6	326	2 5	327	2	328	6.5.6.4	329	8.6	330	8.7
331	3	332	6.5.8.7	333	2.5.6.4	334	8	335	6	336	2.5	337	2	338	5 4	339	6	340	7
341	2 4.3	342	8.7	343	2.5.4	344	8	345	5.6	346	2.5	347	2	348	5.6.4	349	7 6	350	8 7
351	3	352	8.7	353	5.4	354	7.8	355	5.6	356	5	357	2	358	5 6 5.4	359	8.7.6	360	8 7
361	3	362	8.6.7	363	2.5.6.4	364	8	365	6	366	2.4.6 5	367	3.2	368	6.4	369	6	370	7
371	3	372	7	373	1.4	374	8	375	5.6	376	2.5	377	2	378	4	379	6	380	7
381	3	382	6.5.7	383	6.5.7.6 4	384	7.8	385	6	386	2.7.6 7.6 5	387	2	388	6.4	389	6	390	7
391	2.4.3	392	6 5.7	393	6 4	394	8	395	5 6	396	2.4.7.5	397	2	398	6.4	399	6	400	7
401	2.3	402	7	403	2.6.4	404	7.8	405	5.4.6	406	5	407	2	408	5 4	409	7.6	410	8.7
411	3	412	7	413	4	414	8	415	5.6	416	5	417	3.2	418	3 4	419	5.6	420	7
421	3	422	7	423	2.4	424	8	425	5.6	426	2 4 5	427	2	428	4	429	7.3.5 6	430	7
431	3	432	7	433	6.4	434	7.8	435	6	436	2.3.4 2.3.1 6 4.5	437	2	438	3 4	439	8.7.6	440	7
441	2.4.3	442	6.5.7	443	4	444	7.8	445	6	446	2.3.5	447	2	448	2.6.4	449	3 4 6	450	7
451	2 4.3	452	7	453	2.6.5.4	454	7.8	455	6	456	2 6 4 5	457	2	458	6 4	459	7 6	460	7
461	3	462	7	463	5.4	464	8	465	6	466	5	467	2	468	6 4	469	7.6	470	7
471	3	472	8.7	473	1.4	474	8	475	6	476	1.7.5	477	2	478	6.4	479	7.6	480	7
481	3	482	8 7	483	5.3.2 6.4	484	8	485	6	486	7.4 5	487	2	488	4	489	6	490	7
491	3	492	6.5.7	493	6.7.4	494	8	495	7.5.6	496	7.5	497	2	498	6 6.6 5.6.4	499	6	500	7
501	3	502	8 6.6.5.7	503	2.4	504	8	505	7.6	506	6.5	507	2	508	6 4	509	7.6	510	7
511	3	512	7	513	4	514	8	515	6	516	7 6 5	517	2	518	2.4	519	5.7.8.6	520	7
521	3	522	7	523	5.4	524	8	525	7.6	526	5	527	2	528	5.6.4	529	6	530	8.7
531	3	532	7	533	6.4	534	8	535	6	536	5	537	2	538	6 4	539	7.6	540	8.7
541	3	542	8.6.7	543	5.6.4	544	8	545	6	546	5	547	2	548	6 4	549	6	550	7
551	3	552	7	553	2.5.6.4	554	8	555	6	556	4 5	557	3.2	558	4	559	7.6	560	8.7
561	3	562	7	563	6.5 4	564	8	565	6	566	2.5	567	2	568	4	569	5.4 6	570	7
571	3	572	7	573	5.6.4	574	8	575	6	576	5	577	2	578	6 4	579	6	580	7
581	3	582	8.6.5.7	583	5.4	584	8	585	5.6	586	4.5	587	2	588	4	589	5 4.6	590	6.7
591	3	592	7	593	6.4	594	8	595	5.6	596	5	597	2	598	4	599	8 6	600	7

TABLE 10—*Continued*

RESULTS FOR MALE IN PROBLEM 4

	S. 1		S. 2		S. 3		S. 4		S. 5		S. 6		S. 7		S. 8		S. 9		S. 10
T.	2.**3**.4	T.	5.6.**7**.8.9	T.	3.4.**5**.6.7	T.	7.**8**.9	T.	4.5.**6**.7.8	T.	1.2.**3**.4.5	T.	1.**2**.3	T.	2.3 **4**.5 6	T	4 **5**.6	T.	6.**7**.8
1	3	2	8.7	3	6.4.5	4	7.8	5	6	6	2.4.2.5.3	7	2	8	5.4	9	6.5	10	7
11	3	12	7	13	6.5	14	8	15	6	16	2.4 5 2.4.3	17	2	18	4	19	6 6 5	20	8.7
21	3	22	8.7	23	6.5	24	8	25	6	26	2.4 5.3	27	2	28	4	29	6.5	30	7
31	3	32	7	33	6.4.5	34	7.8	35	6	36	2 4.5.2 3	37	2	38	6.4	39	6.5	40	7
41	3	42	8.7	43	6.5	44	8	45	6	46	4.4.5 2.4 3	47	2	48	4	49	4.5	50	7
51	3	52	6.7	53	6.4.5	54	8	55	6	56	4.5 3	57	2	58	4	59	5	60	6.7
61	3	62	7	63	4.5	64	7.8	65	6	66	4.3	67	2	68	4	69	5	70	7
71	3	72	7	73	4.5	74	8	75	4.5.6	76	2.4.3	77	2	78	4	79	4.5	80	6 7
81	2.4.3	82	6.5.6 7	83	4 5	84	7.8	85	6	86	2.4.3	87	2	88	4	89	6.5	90	7
91	2.4.3	92	7	93	4.5	94	7 8	95	4.5.6	96	4 3	97	2	98	4	99	4.5	100	7
101	2.4.3	102	6.5.7	103	5	104	8	105	7 6	106	4 5.3	107	2	108	4	109	5	110	8.7
111	3	112	7	113	5	114	8	115	6	116	2.3	117	2	118	6.4	119	5	120	8.7
121	3	122	8.7	123	6 4.5	124	8	125	6	126	4 2.3	127	2	128	5.6 4	129	6.5	130	7
131	3	132	7	133	5	134	8	135	6	136	4 2 3	137	2	138	3.4	139	5	140	7
141	3	142	7	143	5	144	8	145	6	146	4 2.3	147	2	148	4	149	5	150	7
151	3	152	8.7	153	4.5	154	8	155	4.5 6	156	4.5.3	157	2	158	4	159	5	160	7
161	3	162	7	163	5	164	8	165	6	166	2.4.3	167	2	168	4	169	5	170	7
171	3	172	7	173	5	174	8	175	6	176	2 4.3	177	2	178	4	179	5	180	7
181	3	182	7	183	6.4.5	184	8	185	6	186	2.3	187	2	188	4	189	6 5	190	7
191	3	192	7	193	6.5	194	7.8	195	5.6	196	3	197	2	198	6.5.6.4.3	199	5	200	7
201	3	202	7	203	5	204	8	205	6	206	2.3	207	2	208	4	209	6 5	210	7

TABLE 11

DAILY SERIES AND AVERAGES WITH RATIOS OF CORRECT TO INCORRECT FIRST CHOICES

PROBLEM 4

Female							Male						
Date	No. of trials	R	W	R	W	Ratio of R to W	Date	No. of trials	R	W	R	W	Ratio of R to W
Aug.							Aug.						
4	1–	0	5				4	1	0	5			
"	6–	0	5				"	6–	1	4			
"	11–	4	6	4	16	1:4 00	"	11–	3	7	4	16	1:4.00
5	21–	2	8				5	21–	2	8			
"	31–	3	7	5	15	1:3 00	"	31–	2	8	4	16	1 4 00
6	41–	3	7				6	41–	4	6			
"	51–	4	6	7	13	1:1 86	"	51–	4	6	8	12	1:1 50
7	61–	2	8				7	61–	2	8			
"	71–	4	6	6	14	1.2 33	"	71–	3	7	5	15	1:3 00
8	81–	4	6				8	81–	4	6			
"	91–	2	8				"	91–	5	5			
"	101–	2	8	8	22	1:2 75	"	101–	5	5	14	16	1:1 14
9	111–	3	7				9	111–	3	7			
"	121–	4	6				"	121–	3	7			
"	131–	8	2	15	15	1:1	"	131–	4	6	10	20	1:2 00
10	141–	3	7				10	141–	4	6			
"	151–	4	6				"	151–	3	7			
"	161–	6	4	13	17	1:1 31	"	161–	3	7	10	20	1:2 00
11	171–	5	5				11	171–	5	5			
"	181–	3	7				"	181–	4	6			
"	191–	4	6	12	18	1:1.50	"	191–	6	4	15	15	1.1
12	201–	5	5				12	201–	5	5			
"	211–	3	7				"	211–	3	7			
"	221–	5	5	13	17	1:1 31	"	221–	4	6	12	18	1:1 50
13	231–	8	2				13	231–	4	6			
"	241–	3	7				"	241–	5	5			
"	251–	4	6	15	15	1:1	"	251–	5	5	14	16	1:1.14
14	261–	8	2				14	261–	5	5			
"	271–	4	6				"	271–	3	7			
"	281–	6	4	18	12	1: 67	"	281–	4	6	12	18	1:1.50
15	291–	3	7				15	291–	5	5			
"	301–	3	7				"	301–	5	5			
"	311–	3	7	9	21	1.2.33	"	311–	3	7	13	17	1:1 31
16	321–	3	7				16	321–	3	7			
"	331–	6	4				"	331–	6	4			
"	341–	4	6	13	17	1:1 31	"	341–	2	8	11	19	1:1 73
17	351–	4	6				17	351–	3	7			
"	361–	4	6				"	361–	5	5			
"	371–	4	6	12	18	1:1.50	"	371–	7	3	15	15	1:1
18	381–	5	5				18	381–	5	5			
"	391–	5	5				"	391–	4	6			
"	401–	7	3	17	13	1: 76	"	401–	3	7	12	18	1:1 50
19	411–	6	4				19	411–	6	4			

TABLE 11—*Continued*

DAILY SERIES AND AVERAGES WITH RATIOS OF CORRECT TO INCORRECT FIRST CHOICES

PROBLEM 4

Female							Male						
Date	No. of trials	R	W	R	W	Ratio of R to W	Date	No. of trials	R	W	R	W	Ratio of R to W
Aug.							Aug.						
"	421–	7	3				"	421–	6	4			
"	431–	4	6	17	13	1. 76	"	431–	5	5	17	13	1. .76
20	441–	6	4				20	441–	4	6			
"	451–	2	8				"	451–	4	6			
"	461–	7	3	15	15	1:1	"	461–	7	3	15	15	1:1
21	471–	6	4				21	471–	5	5			
"	481–	6	4	12	8	1. .67	"	481–	7	3	12	8	1: 67
22	491–	7	3				22	491–	5	5			
"	501–	4	6				"	501–	4	6			
"	511–	4	6	15	15	1.1	"	511–	7	3	16	14	1: 88
23	521–	6	4				23	521–	6	4			
"	531–	7	3				"	531–	6	4			
"	541–	5	5	18	12	1: 67	"	541–	7	3	19	11	1: 58
24	*551–	4	6				24	551–	5	5			
"	561–	6	4				"	561–	7	3			
"	571–	7	3	17	13	1: 76	"	571–	8	2	20	10	1: .50
25	581–	5	5				25	581–	4	6			
"	591–	4	6	9	11	1:1 22	"	591–	7	3	11	9	1: 82
25	1–	7	3	7	3	1: 43	25	1–	4	6	4	6	1:1 50
26	11–	7	3				26	11–	6	4			
"	21–	7	3				"	21–	6	4			
"	31–	6	4	20	10	1: 50	"	31–	5	5	17	13	1: 76
27	41–	6	4				27	41–	6	4			
"	51–	5	5				"	51–	6	4			
"	61–	5	5	16	14	1: 88	"	61–	7	3	19	11	1:.58
28	71–	5	5	5	5	1:1	28	71–	5	5	5	5	1:1
30	81–	5	5				30	81–	4	6			
"	91–	7	3				"	91–	4	6			
"	101–	5	5	17	13	1: 76	"	101–	5	5	13	17	1:1 31
31	111–	6	4				31	111–	7	3			
"	121–	7	3				"	121–	5	5			
"	131–	5	5	18	12	1: 67	"	131–	8	2	20	10	1: 50
Sept.							Sept.						
1	141	5–	5				1	141–	9	1			
"	151	5–	5				"	151–	6	4			
"	161	5–	5	15	15	1:1	"	161–	9	1	24	6	1: 25
2	171	9–	1				2	171–	9	1			
"	181	6–	4				"	181–	7	3			
"	191	7–	3	22	8	1: 36	"	191–	6	4	22	8	1: .36
3	201	5–	5	5	5	1.1	3	201–	8	2	8	2	1: 25

After six hundred trials had been given to each individual by use of the series of settings presented on page 192, under problem 4, it was apparent that the animals could succeed in solving the problem only by acquiring a definite habit for each particular setting, and it was further evident that the settings including seven and nine open doors were extremely difficult for the animals. For these reasons it was decided to present a modified series of settings in which the groups should consist of either three or five open doors. Two hundred trials were given with the new series of settings, and the settings themselves, as well as the results obtained, appear at the bottom of tables 9 and 10.

Two important conclusions are justified by these results. First, that the pigs, in so far as they had succeeded in responding correctly to the middle door, had reacted to particular settings. And second, that with sufficiently prolonged training they could perfectly solve the problem of the middle member of a series, if the total number in a group of open doors did not exceed five. As a matter of fact, no series of ten correct choices was obtained with either individual because of the surprisingly strong and persistent influence of the original settings.

Let us consider, for example, setting 3. This originally consisted of the group 1.2.3.**4**.5.6.7, in which no. 4 was the box to be entered. In the modified settings, this group was changed to 3.4.**5**.6.7, consequently, the box to be entered was 5 instead of 4. Now, whereas in the case of setting 1 which remained unchanged, the female made only one mistake in twenty-one trials subsequent to the modification of the settings, in the case of setting 3 she chose wrongly in all except three of the twenty-one trials, and this in spite of the fact that in the case of settings 2 and 5, both of which involved five open doors, she chose correctly sixteen times out of twenty-one. Similarly in the case of setting 6, in which originally all nine of the doors were open, whereas in the modification only doors 1, 2, 3, 4 and 5 were used, both the female and the male chose correctly only once in twenty-one trials.

Although the above conclusions are of primary importance, further examination of the data of tables 9 and 10 should throw additional light on the reactive capacity of our subjects.

We shall consider the materials according to the number of

mechanisms used in the settings. Settings 1, 4, 7 and 10 involve three members, setting 2, 5 and 8, five members; settings 3 and 9, seven members; and setting 6, nine members. Below are presented the number of correct first choices made by each individual in connection with each setting, the total number of choices being sixty.

Correct First Choices *in Sixty* for Each Setting in Problem 4

	S.1	S.2	S.3	S.4	S 5	S.6	S.7	S 8	S.9	S.10
Female. .	35	22	16	45	22	10	49	11	22	38
Male	41	21	4	48	27	12	52	11	19	34

These figures prove that to select the middle member of a group of three is fairly easy for the pig. This, to be sure, might be gathered from the fact that the animal can solve the problem of the second from the left. It further appears that attempts to locate the proper box when it was the middle of a series of five resulted in a gradual reduction in the number of incorrect choices, but never yielded success. The selection of the middle member of a group of seven or of nine is clearly still more difficult, and there is no reason to suppose that with less than thousands of trials the subjects in question would have learned to enter it directly.

It is practically certain that the series of settings rather than the number of members in a group is responsible for the animal's confusion. Doubtless by training a pig to react correctly to each setting and by then presenting the several settings in a certain definite order, a habit could be built up which would apparently yield a perfect solution of problem 4. It is, however, needless to point out that this would not be the kind of solution that has been obtained for problems 1, 2 and 3, or in other words, would not be dependent upon response to the general relation middleness.

Analysis of the records for the sixty trials under setting 6 are of special interest, since this setting proved the most baffling of all to the subjects.

To begin with, they naturally tried the end members of the series. This proving unsatisfactory, they next tended to choose rather at random, and then there gradually appeared a tendency to enter, first, box 2 and to proceed thence either directly or

by way of 3, 4 and sometimes also 6, to the middle box, number 5. This tendency to select, when in doubt, a box second from the right end of the series may possibly be due in part to the fact that the box to be chosen in setting 7 was number 2. At any rate, the frequency with which the female throughout her training chose box 2 first of all under setting 6 is surprisingly high, whereas for the male, this frequency while rather high early in the course of the training, tended to diminish and to give place to the decidedly profitable tendency to choose a box near the middle of the series, 6, 7 and 5 frequently being entered.

Similarly, we might, if space permitted, analyse in detail the results for the other settings. We have chosen to use our space in this report for the presentation of data in tabular form rather than for their description, because we are convinced that the facts are more important than early attempts at interpretation.

SUMMARY

1. The pig has proved itself an ideal subject for studies in adaptive behavior.

2. The new multiple choice method, by means of which standardized problems ranging in difficultness from the very easy to the very difficult may be presented to widely differing types of organism, has in our opinion fully justified our expectations, for it has proved admirably suited to the discovery and analysis of increasingly complex types of behavior.

3. For the purpose of discovering the extent to which ideational and closely allied types of behavior exist in the pig, four problems were presented. They may be defined simply in terms of the constant relation of the right mechanism, as (1) the first at the right end of the series; (2) the second from the left end of the series; (3) alternately, the first at the left and the first at the right; (4) the middle member of the series.

The purpose of the experiments was to discover the pig's reactive tendencies and especially its degree of ability to dissociate the essential and constant relation of the right mechanism from its accidental and variable accompaniments.

4. The two subjects solved perfectly the first problem with less than fifty experiences. The indications are that visual and kinaesthetic guidance sufficed.

The second problem was solved more slowly, partly because the influence of the earlier training had to be overcome, but

also because this is a much more difficult problem than the first one. In this also, visual and kinaesthetic guidance seems to account for success, but the extent to which the animals learned to respond to the relation of secondness from the left, no matter what the other relations of the mechanism, was a surprise to the experimenters and is important in connection with the problem of ideation in animals.

The third problem also was solved with reasonable ease, and the animals demonstrated their ability to acquire the habit of alternation without respect to particular groups of reaction-mechanisms.

Problem 4 proved too difficult for the pigs. They learned to select the middle mechanism of the series when the groups were small, but when seven or nine mechanisms were in use, they were confused. The indications are that with long training they would learn to react to the particular settings correctly, although incapable of reacting to the constant relation of middleness.

5. Our results indicate for the pig an approach to free ideas which we had not anticipated. There seems no reason to doubt that visual and kinaesthetic factors in the main determine their responses, but it is evident that they are not so dependent upon the particular situation as are many other mammals. While hesitating to claim that we have demonstrated the presence of ideas, we are convinced that the pig closely approaches, if he does not actually attain, to simple ideational behavior.

6. The multiple choice method has revealed a number of interesting reactive tendencies, their relations to one another, and the varied ways in which they are manifested in connection with situations which are rather difficult to meet.

7. Finally, we would again call attention to the fact that this method of studying behavior should enable us, when it has been reasonably perfected and its problems standardized, to determine the level of mental development in different individuals, species, stages of growth, and conditions of normality, and to compare the reactive tendencies, whether or not ideational, of other organisms with those of the human subject. Our results thus far fully convince us that the method may be made to yield more valuable psychological and behavioristic information than has any previous approach to ideational problems.