COLOR DISCRIMINATION IN CANARIES*

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Introduction.—It is a common belief that lower animals lack the ability to discriminate between colors. Such an assumption seemed to be unfounded for most of the species studied and therefore indicated the need for testing many more forms. Among birds the chicken, pigeon, ring dove, and shell parakeet have been tested and all showed color discrimination. Among Passeriformes, the English sparrow and cow-bird were tested with colored papers but these methods have since been proved inadequate due to intensity factors.

The author, in a previous experiment, had trained canaries to discriminate between a red and a green filter, thus offering the opportunity to discover whether these birds were responding to differences in the intensities transmitted or to the wave lengths.

Materials and Methods.—A "two-choice" problem box 15 inches high, 42 inches long, and 28 inches wide (Fig. 1), was constructed of plywood. Red and green Wratten A and C Monochromatic light filters mounted as lantern slides were placed over round openings in the end of the maze before the 25W lamps at E_1 and E_2. Overhead lights illuminated the box through a screen wire roof. The birds were transferred from the home cage to small individual cages. Each bird in turn was introduced at the entrance A, went through runway B toward the colored lights. At the open sliding doors, C_1 and C_2, it had to make a choice of going into alley D_1 or D_2. If the bird entered the alley illuminated by the color to which it was being trained to go it was allowed to pass on out into the exit alley F_1 or F_2, through the open door G_1 or G_2, into the return runway H_1 or H_2, and into the home cage. But when the bird was being trained to green and the green filter was at E_2 with the red at E_1, the bird made an error and entered D_1, the door C_1 was immediately closed. For this trial the door G_1 had been closed and the bird ran back and forth in D_1 and F_1 for one minute as penalty for making the incorrect choice. At the end of the minute door C_1 was opened long enough to let the bird back into B and then closed. It then passed through D_2, F_2, out the open G_2, and back to the home cage through H_2. Thus only one error could be made at a trial.

Getting out of the foreign problem box where all visual contact with its fellows was cut off and returning to the home cage to which it was accustomed provided sufficient motivation for rapid learning. The birds usually showed considerable learning in 20 – 30 trials though they continued to improve for variable lengths of time. The birds became trained to either red or green without any apparent aversion to either color. There was a strong tendency shown to go always to the same side regardless of the signal color unless penalties are begun at the outset. This rendered color "preference" experiments meaningless here as was shown in an earlier series.

In order to avoid the one side habit the birds were forced to go out to the right the same number of times as the left according to the pattern LRLLRLRRLR, etc. Even this pattern was altered often enough to show that they had not learned it but were responding to the signal light. The 6 birds reported upon here were all trained to green in a red-green combination and were given 162 trials with 25W lamps behind each filter. By that time they were making an average of only one error in 17 trials.

Color discrimination test. — The next step was to run a series of 28 trials for each bird (168 total) with the light intensity made very unequal behind the filters. This was accomplished by using a 200W in combination with a 25W lamp. The 200W lamp was moved from right to left according to the pattern RLRLRL, etc. Thus the more intense

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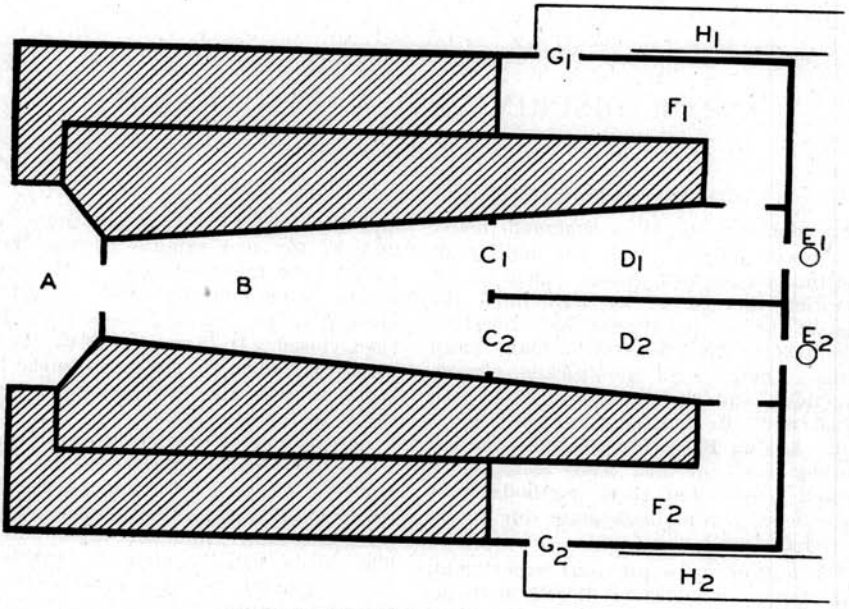

Fig. 1.—Two-choice problem box.

light fell behind the two colors an equal number of times. Though it is known that colors have varying intensity values for different species the great inequality in the light sources would counteract them.

The number of errors made in this series of 168 trials (Table I) was 10 which happened to be the same number as was made in the preceding 168 trials. The average time consumed (Table II) was slightly greater as might be expected after altering the customary conditions.

TABLE I.—NUMBER OF ERRORS IN "TWO-CHOICE" PROBLEM BOX

BIRD	ERRORS PER 7 TRIALS 25W & 25W LAMPS				200W & 25W LAMPS			
109-R	0	0	0	1	0	0	0	0
233-T	0	0	1	0	0	1	0	0
111-C	1	1	0	0	1	0	1	0
115-H	0	0	0	0	1	1	0	1
238-B	0	1	1	1	1	1	0	0
216-L	1	1	1	0	0	2	0	0
	2	3	3	2	3	5	1	1

TABLE II.—TIME REQUIRED IN "TWO-CHOICE" PROBLEM BOX WITH ONE-MINUTE PENALTIES DEDUCTED

BIRD	AVERAGE TIME IN SECONDS FOR 7 TRIALS 25W & 25W LAMPS				200W & 25W LAMPS			
109-R	6.3	6.3	6.1	8.8	8.8	8.3	10.1	8.(
233-T	4.4	6.4	6.0	4.1	6.0	4.8	4.4	4.(
111-C	14.0	8.3	7.3	7.6	11.8	9.6	9.4	8.(
115-H	10.6	11.6	21.8	13.7	22.6	25.0	18.6	17.7
238-B	5.0	6.1	5.6	6.7	5.0	5.4	4.3	4.(
216-L	4.8	4.3	4.7	6.0	5.6	7.8	5.1	4.3
Ave.	7.5	7.1	8.6	7.8	9.8	10.1	8.6	8.(

For further evidence that the response was to color, one or the other of the light sources E_1 or E_2 was turned off. The green trained birds continued going to green in the absence of red or continued to avoid red in the absence of green. A red trained bird under the same conditions continued to the red in the absence of green and avoided green in the absence of red. Further tests were made with one or the other of the filter slides completely removed allowing the white light to show from behind and similar results were obtained.

Conclusions.—Canaries learned to discriminate between red and green light as transmitted through Wratten tricolor light filters A and B. No matter how much the intensities were varied with even one or the other light source entirely removed the birds continued positive to the color to which they had been trained and negative to the one which they were trained to avoid.

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