Notes & News

At the meeting of the *Psychonomic Society* last fall, the Governing Board voted to authorize this *Journal* to carry *Notes & News* of events of interest to members of the Society as well as to its readers. This is the first column devoted to such news. You are encouraged to send us any newsworthy item concerning change of position, promotion, fellowships, or special events. Because some readers subscribe to only one section, we will duplicate items in the two sections so that all of you will "get the word."

The first *Paul M. Fitts Memorial Lectures* were presented at the *University of Michigan* on March 25 through April 3 by **Donald E. Broadbent**, Director of the Medical Research Council *Applied Psychology Research Unit*, Cambridge, England. The general topic of the lectures was *Decision and Stress*. They are an updating of Dr. Broadbent's book on *Perception and Communication*, and will probably be published as a book in the next year or two. Dr. Broadbent was recently elected to Fellowship in the *Royal Society*.

A new publication, the *Journal of Motor Behavior*, is scheduled to appear in March, 1969. Members of its Editorial Board include **Arthur Irion**, **Clyde Noble**, and **Don Trumbo**; its Managing Editor is **Richard A. Schmidt** of the *University of Maryland*.

Wilse B. Webb, retiring as chairman of the Department of Psychology, *University of Florida* in July, 1969, will go to Cambridge, England in September on a National Science Foundation Faculty Development Award. **Irwin Silverman** of the *University of Buffalo* and **Clifford H. Swensen, Jr.**, of *Purdue University* have been spending a sabbatical year at the *University of Florida* during the 1968-1969 academic year.

Daniel P. Kimble has been awarded an NSF Science Faculty Postdoctoral Fellowship for a sabbatical year (1969-1970) at the Institute of Experimental Psychology, *University of Oxford*, Oxford, England. He has also been promoted to the rank of Professor at the *University of Oregon*.

Abram Amsel of the *University of Toronto* will join the faculty of the *University of Texas* in August, 1969, as Professor of Psychology.

Auditory differential conditioning of the rabbit nictitating membrane response: I. Effects of mixed- and separate-phase training¹

PATRICK O'MALLEY,² RALPH B. HUPKA, and JOHN W. MOORE, *University of Massachusetts, Amherst, Mass. 01002*

This study compared several procedures for establishing differential conditioning with tonal stimuli. Eight albino rabbits received 3 days of differential conditioning consisting daily of 60 reinforced (CS+) trials randomly interspersed with unreinforced (CS-) trials (mixed-phase or D). After each of 32 rabbits received 60 trials of continuous reinforcement (CRF) on Day 1, Ss were divided into four groups (separate phase): (a) Group CRF-D was given 60 differential conditioning trials for the remainder of that session; (b) Group CRF-I-D received 10 CS- trials and completed the session on Day 1 with 50 differential conditioning trials; (c) Group 2 CRF-2I-D (10-20-10) received 10 CS-, 20 CS+, 10 CS-, and 20 differential trials; and (d) Group 2 CRF-2I-D (5-10-5) was given 5 CS-, 10 CS+, 5 CS-, and 40 differential conditioning trials. All separate-phase Ss received 120 trials/day of conventional differential conditioning on Days 2 and 3. The separate-phase Ss demonstrated a superior rate of differentiation on Day 2 in comparison with the mixed-phase Ss, but by Day 3 the latter Ss had reached a similar rate of differentiation.

The purpose of this experiment was to compare various training schedules for establishing differential conditioning. A conventional mixed-phase procedure, in which the reinforced (CS+) and non-reinforced (CS-) conditioned stimuli are presented equally often according to a random sequence, was contrasted with various separate-phase procedures in which differentiation followed an initial series of CS+ trials. There were four variations of this separate-phase procedure in all, three involving a long series of CS- trials following the initial acquisition series. On the second and third day of training all groups were compared on a mixed-phase schedule.

According to a simple conditioning-extinction theory of discrimination learning, one in which excitation and inhibition combine algebraically and in

which sequential or contrast effects are minimized, the rate of differentiation and the level of responding to each CS of a particular pair depends only on the number of CS+ and CS- trials and not on their pattern of presentation. Number of trials is presumably the only essential variable in determining the growth of excitation and inhibition to the two CSs, and hence the amount of generalization of these processes between CS+ and CS-. Such a model has proved adequate when applied to human eyelid conditioning experiments employing either separate- or mixed-phase schedules (Gynther, 1957; Homzie, 1968).

SUBJECTS

The Ss were 40 naive, male and female New Zealand White rabbits, 90-120 days old.

APPARATUS

Four rabbits were run concurrently in a four-drawer fire-proof filing cabinet. Each drawer was serviced by separate and independent control and recording equipment located in an adjoining room. A panel in front of each S supported two house lights (4 V dc behind translucent white plastic) and three impedance matched speakers which provided tones and a continuous white masking noise of 75 dB SPL. Each drawer was independently ventilated by centrifugal blowers. The animals were restrained in clear plastic boxes identical to those developed by Gormezano (1966). The superior and inferior external eyelids of S's right eye were kept open by means of small clips. The hook-up to the nictitating membrane was accomplished by means of a minitorque potentiometer and surgical suture arrangement similar to that described by Gormezano. Movements of the right nictitating membrane were amplified and recorded on a Grass 5D inkwriting oscillograph. A conditioned response (CR) was defined as any 1-mm positive deflection of the recording pen within the interstimulus interval (ISI). The UCS consisted of a 2-mA ac shock of 50-msec duration applied to wound-clip electrodes on the infraorbital region of the right eye. Duration of the CS was equal to the ISI plus 50 msec. The pure tones used as CSs were generated by Hewlett-Packard audio-oscillators

(Type 200 AB) and attenuated to approximately 75 dB SPL at the position of S's head.

PROCEDURE

Using tones of 1200 and 300 Hz for CS+ and CS- (counterbalanced), and ISI of 250 msec, and an intertrial interval (ITI) which averaged 1 min, five groups of eight Ss received 3 days of training, the difference in training among the groups occurring only on Day 1 in accordance with the following schedules: (a) conventional mixed-phase differential conditioning (D), in which CS+ and CS- were presented equally often on a random schedule for 120 trials/day for 3 days; (b) CRF-D, in which S received 60 reinforced presentations of CS+ followed by 60 differential trials for the remainder of that session and for Days 2 and 3; (c) CRF-I-D, which consisted of six CS+ trials followed by 10 CS- trials and 50 differential trials on Day 1; (d) 2 CRF-2I-D (10-20-10), which consisted of 60 CS+, 10 CS-, 20 CS+, 10 CS-, and 20 differential trials on Day 1; and (e) 2 CRF-2I-D (5-10-5), in which the length of the intermediate sequence of CS-, CS+, and CS- was 5, 10, 5 trials, and the differential trials on Day 1 numbered 40. Hence, on Day 1 the five groups received CS+ trials with frequencies of 60, 90, 85, 90, and 90, respectively, and CS- trials with frequencies of 60, 30, 35, 30, and 30, respectively. All groups received 120 trials/day of conventional differential conditioning on Days 2 and 3. In any series of conventional

differentiation trials in this experiment and in those presented later, the randomization was restricted such that no more than two CS+ or CS- trials occurred in succession.

RESULTS AND DISCUSSION

The mean percentages of CRs to CS+ and CS- on Days 2 and 3 are shown in Fig. 1.³ The first pair of points in each part of the figure give the mean percentage of CRs to CS+ (upper) and CS- (lower) for the mixed-phase portion of Day 1 for each group. As expected, the preliminary series of reinforced trials elevated the level of responding to CS+ on Day 2, but the conventional group (D) caught up by Day 3. Inhibition generated by an interpolated series of CS- trials produced lower levels of responding to CS+ on Day 2, compared with Group CRF-D, but the degree of CR-³ suppression achieved by these groups was not quite as good as that obtained by Group D.

An index of relative differentiation (IRD), proposed by Restle & Beecroft (1955), expresses differentiation as a ratio of the differences between CR+ and CR- (%CR+ minus %CR-) to the sum of responding (%CR+ plus %CR-). Table 1 shows that on Day 2 the IRD was only .20 for Group D but increased to .51 on Day 3. By contrast, the IRD of the three I groups and Group CRF-D achieved a fairly high level (mean IRD = .43 for the latter four groups) by Day 2. This effect can be deduced from Fig. 1, and this Treatment by Days interaction of IRDs was significant

Table 1
Mean IRDs (Indices of Relative Differentiation) on Days 2 and 3 as a Function of Day 1 Training Schedule

Group	Day 2	Day 3
CRF-2I-D (5-10-5)	.53	.45
CRF-2I-D (10-20-10)	.42	.46
CRF-I-D	.42	.47
CRF-D	.35	.31
D	.20	.51

($F = 2.84$, $df = 4/30$, $p < .05$). Thus, pre-conditioning to CS+ and a series of extinction trials to CS- yielded good differentiation by Day 2, but no better than that achieved by Day 3 with a more conventional procedure. By contrast, pre-conditioning to CS+ without an interpolated series of CS- trials yielded a mean IRD of only .31 on Day 3. Generally, these results are quite consistent with the sort of simple conditioning-extinction model which has been successfully applied to human eyelid conditioning. Frey & Ross (1967), investigating differential eyelid conditioning in rabbits, found that the presence of CS- in a mixed-phase procedure did not retard the rate of conditioning compared with a separate-phase control group. While this observation runs counter to the present experiment, in which conditioning in Group D was substantially retarded relative to the other groups, an explanation of the discrepancy might lie in the different levels of cue similarity employed in the two studies. The 800- and 2500-Hz tones (at 90-dB SPL) employed by Frey and Ross might have been too dissimilar for generalization of inhibition to retard acquisition to CS+.

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NOTES

1. This research was supported by NSF Grant GB 5480.
2. Now at the University of Michigan.
3. The notations CR+ and CR- are abbreviations for CRs to CS+ and CRs to CS-.

Fig. 1. Differential conditioning on Days 2 and 3 as a function of Day 1 training.