thogonal components. Of these components only the linear was significant ($p < .005$, F-test). This analysis showed that the linear function for the group injected with strychnine was positive—that is, these subjects made increasingly more correct responses. The control subjects, on the other hand, tended to perform at chance level ($p = .33$).

The finding that post-trial injections of strychnine sulfate facilitate the learning of a simple discrimination task and a discrimination reversal task is consistent with previous studies of drug effects upon discrimination learning (*8*) and supports the hypothesis that strychnine facilitates consolidation of the memory trace.

The finding that strychnine facilitated the solution of a simple oddity problem was also consistent with the hypothesis given above. However, since the oddity problem has been shown to be extremely difficult, the present findings would suggest that the rat's difficulty in solving such problems results from a memory storage process which is either slow or inefficient. Since oddity training was discontinued before the control subjects showed improvement in performance, the question remains as to whether strychnine enhanced the rate of memory storage or the learning capacity of the subjects. Earlier writers (*9*) have suggested that individual differences in learning capacity are dependent upon differences in rate of memory storage. Further, previous work suggests that the rate of efficiency of memory storage decreases as a function of the difficulty of the task to be learned (*10*). In the present situation, then, it might be supposed that strychnine increased the rate or efficiency of memory storage so that the storage rate exceeded the rate required to solve the difficult oddity problem. The question of rate or capacity, then, is reduced to the same term. This interpretation would require empirical demonstration since it is only inferred from earlier experiments (*9, 10*).

It is important to note that the subjects were injected *after* each daily block of trials. Therefore, the subjects were not influenced by the drug while in the apparatus. Thus, the injections should have influenced only the postulated consolidation process (*6, 7*), not motivation, perception, or other performance variables.

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Perceptual Preferences and Imprinting in Chicks

Abstract. *Whether initially exposed to a strikingly patterned model or to a plain white one, Vantress-cross chicks subsequently preferred to follow the striking model. Controls given the choice at the initial training age, and other (untrained) controls given the choice at the subsequent testing age, did not show a preference.*

We have previously argued (*1*) that imprinting represents the establishment of a perceptual preference and that the visual properties of the model used for imprinting will influence the strength of the bond between subject and model (see *2, 3*). These conclusions were based upon studies with Pekin ducklings (*Anas platyrhynchos*). We now present data from a comparable study with Vantress-cross chicks which confirm and extend our earlier conclusions.

The subjects consisted of 168 incubator-hatched domestic Vantress-cross chicks; they were kept in the dark, without food or water, in groups of three to ten. Forty-two birds were "trained" by individual exposure to a "plain" model (group P); another 42, to a "striking" model (group S). Two control groups of 42 birds each were not trained at all.

The models were life-size mallard duck decoys made of papier maché. The "plain" model was painted a flat white; the "striking" model was basically yellow, adorned with bilaterally symmetrical patches and stripes of bright red, green, blue, and brown—quite unlike the coloring of any species of fowl! The models were suspended over a flat-black table by wires from the arms of a "T," and were rotated according to a fixed schedule: 15 seconds' movement, 5 seconds' pause. The speed of movement was about 20 m/min, five complete circuits of the 1.5-m diameter taking 150 to 165 seconds. Each model carried a loudspeaker emitting recorded sounds. The entire apparatus [described in (*1*)] was acoustically isolated from the experimenter; observations were made through one-way glass.

At an early age (21 days and 12 hours to 22 days and 5 hours after the onset of incubation of the egg at 38.5° to 39.0°C), all chicks in groups P and S were individually exposed to either the plain or the striking model for a total of 20 minutes (training exposure). This age covers the peak of the "critical period" for the elicitation of the following-response, and, presumably, for imprinting (*1*). The model at this time emitted a continuous "Kom - kom - kom - kom" sound. Twenty-four hours later, each chick was exposed to both models simultaneously, each model being suspended from one arm of the "T"; no sounds accompanied this 20-minute test exposure. The controls, which had received no previous training exposure, were tested without any sound accompaniment. The chicks in control group 1 were tested at the training age (21 days and 12 hours to 22 days and 3 hours); those in control group 2, at the testing age (22 days and 12 hours to 23 days and 5 hours).

The observer, using electric timers, scored the duration of the following-response, which was defined as: (i) moving in the same direction as the model and within 30 cm of its tail or 10 cm of its sides, or (ii), after following the model up to the moment of

Table 1. Mean following scores during training and testing.

Group	Mean following score (seconds) To plain model	Mean following score (seconds) To striking model	*p* of chance difference
		At training age	
P	159.3		.604
S		202.8	
Control 1	29.9	32.2	.262
		At testing age	
P	98.0	137.0	.0024
S	72.2	156.5	.0003
Control 2	33.5	36.4	.272

the pause, then being within the required distance, or making physical contact with the model during the pause. Differences in following scores within groups were tested nonparametrically with the Wilcoxon two-tailed matched-pairs signed-ranks test; those between groups, with the Mann-Whitney U-test.

The results were clear-cut. Chicks of both experimental groups followed their respective training models at the initial exposure, with no significant differences in time scores; controls given the choice at the same age showed no preference (Table 1). During the subsequent test, however, both experimental groups preferred the striking model, while untrained controls of the same age showed no preference (Table 1). (Experimentals that did not follow during training, but merely sat watching the model, showed the same subsequent preference as initial "followers," although not as strongly.) These results are even more remarkable than our previous finding (*1*) that ducklings trained to a plain decoy showed no clear subsequent preference for their training model, while ducklings trained to the striking decoy did prefer theirs.

Chicks in control group 2, having had no training, failed to follow any model strongly, thus supporting the results of all previous investigators. Chicks in control group 1 probably did not follow as strongly as the experimentals because their presentation lacked sound stimuli.

These results cast doubt on the generality of conclusions derived from previous imprinting studies where the experimental variables were not applied to several groups of birds having various kinds of training models.

From our results, we deduce the following. (i) "Priming," or initiation of the following-response, requires an exposure to a (moving?) model, presumably during the critical period (*1*, *2*). (ii) Once primed, the following-response does not necessarily attach to the training model; other perceptual preferences may be of over-riding importance. (iii) Following during training appears not to be essential to the effectiveness of the training period, even though more initial followers than nonfollowers subsequently showed a clear preference for a particular model.

This evidence accords with our stated position (*1*) on the primacy of perceptual processes in imprinting and opposes the importance of motor responses as expressed in the "law of effort" (*6*). Stated differently, the generalization of the responses to, or the preference for, an object to which no prior exposure was made is greater than the preference for the training object.

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Depth Perception Loss with Local Monocular Suppression: A Problem in the Explanation of Stereopsis

Abstract. *Contours added to only one eye's view cause both suppression of the other view and loss of perceived depth. Since piecemeal contralateral suppression may be the general rule of binocular combination, the finding that suppressed views do not contribute to stereopsis raises basic questions about the nature of stereoscopic depth perception.*

Stereoscopic depth perception is caused by differences in the two eyes' views. In Fig. 1*A*, if both eyes fixate rod 1, its image falls on sets of corresponding points in the retinas of the two eyes, and we see only one rod. The image of rod 2 falls on noncorresponding or disparate points (Fig. 1*C*), and rod 2 looks doubled. If this disparity is small (less than 0.25 degree of visual angle), rod 2 looks single and nearer than rod 1. The disparity in retinal points stimulated by an object's images is often considered to be the basis of the object's apparent depth (*1*).

It now appears that a contour that stimulates the retina of one eye produces a field of contralateral suppression of about 0.25 degree, within which the view received by the other eye cannot be seen (*2*), so that, if a point is visible in the combined view, its counterpart in the other eye's image is not simultaneously visible. In fact, considerable evidence suggests that the combination of the two eyes' views always proceeds by piecemeal regional suppression of one view or the other (*3*). If one member of each pair of disparate points is always suppressed, how can the disparity effect our depth perceptions? The usual answer has been that the nervous system somehow registers the locus of the suppressed image, even though the image itself is not seen consciously. The observations reported here, however, suggest that this answer is wrong: the visual system does not use the information in the suppressed image while it is suppressed.

In Fig. 1*D*, *1*, view *L* is pink; view *R*, light green. If the black point, *x*, is fixated while the two views are in a stereoscope, the outer ring appears in the combined view, at *2*, as a single complete circle, changing in color from moment to moment and from one region to another (*4*). The small circle is clearly farther than the large one; if we keep our eyes carefully fixed on point *x*, the small circle is not a single ring, but fragments of both I_L and I_R, fragments that appear and disappear rapidly and unpredictably. Occasionally, only a pink circle (I_L) or a green one (I_R) is seen and, when that happens, stereodepth vanishes, and both large and small circle appear in the same plane. This is a difficult and dubious observation, since such moments of complete monocular dominance are rare and fleeting. The following experimental procedures increase the duration of the phenomenon.

Stereograms *E*, *F*, and *G* were each viewed in a Zeiss stereoscope for eight trials each of 20 seconds duration, in counterbalanced order, by each of five observers (four of them naive as to the purpose of the experiment). Observers pressed a right-hand key when the small circle appeared farther than the large one, a left-hand key for the reverse, and neither when the figure looked flat. Median key-pressing times for each are shown in Fig. 1. For every observer, the following was true: *F* was predominantly flat, and significantly different from stereograms *E* and *G* ($p < .01$, by the t-test), both of which showed predominant stereodepth.

The grating in Fig. 1*F* was designed to suppress I_R; each grating line overlapped the contralateral suppressive fields produced by its neighbors (*5*).