1 part of precipitated calcium carbonate
1 part of precipitated calcium phosphate
1 part dried yeast[1]

This ration contains from 19 to 20 per cent. of protein, .9 to 1 per cent. of calcium, and .5 to .6 per cent. of phosphorus. It is composed of materials that are readily obtainable for any laboratory and of standard materials available on the market. The yeast was added because of the better growth that was obtained through its use. White Leghorn chicks started on this ration in the presence of an adequate supply of vitamin D will weigh 300 to 325 grams at the end of 6 weeks; without the yeast they will be 50 to 100 grams lighter. We preferred to have a ration that gave good rates of growth. Day-old White Leghorn chicks placed upon this ration will become distinctly rachitic in from 28 to 35 days, and some of the birds may be dead by the end of the fifth week, with an ash content of the extracted tibia approximating 30 per cent. In the presence of an adequate supply of vitamin D, White Leghorn chicks fed this experimental ration for 35 days will weigh about 225 grams, and the ash content of the extracted tibia will generally be 43 + per cent.

Our technique in conducting the experiment is as follows: White Leghorn chicks, one-day old and weighing 30 to 35 grams, are placed in groups of 6 or 8 in warmed hovers provided with screen bottoms. These screen bottoms are made of wire mesh, either two or three mesh to the inch, and used for the purpose of minimizing excreta consumption. Shavings are placed under this false screen bottom. The birds are fed water only for the first day; but on the second day they are given small portions of the ration upon a cardboard mat. On the third day the ration is placed in suitable feeders and so continued during the 5 weeks of the experiment. If consumption records are desired the birds can be placed in individual cages and fed through suitable grids, whereby accurate consumption records can be obtained. The birds are weighed weekly. At the end of the fifth week they are killed, the tibiae removed and placed in 95 per cent. alcohol until convenient to proceed with the analysis. They are then crushed, individually wrapped in filter-paper, and extracted for 72 hours with hot 95 per cent. alcohol. Finally the bones are dried, weighed, and ashed in an electric muffle furnace for 1 hour at a cherry red heat (about 650° C.). The percentage of ash is used as the index for estimating the degree of calcification.

The curative type of experiment and the "line test" as used in the case of the rat are not possible in the case of the chick. In the healing of rickets in the chick there is no distinct line of calcification, but healing is diaphyseal and immediately contiguous with the trabeculae that remain after rickets is produced. Consequently no distinctive "line" is formed during healing.

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[1] The yeast was obtained from the Northwestern Yeast Company, Chicago, Illinois. Experimental yeast (powdered yeast foam tablets) with 50 per cent. + of protein).

AN INVESTIGATION OF "INSIGHT" IN RATS

IN some preliminary experiments conducted recently the writer sought to get further evidence on the existence of "insight" in rats.

The problem was formulated as follows: If rats have learned to take a difficult path to food in preference to an easy but blocked path, and if then the easy path is offered as a short cut to food, what type of reactions will occur? According to a mechanistic theory of learning the rats should continue to take the difficult path even if the easy path has been so arranged as to lead to food under the most favorable conditions. On the other hand according to theories which oppose the simple mechanistic formulations, one might expect the operation of "insight" as indicated by an immediate or rapid switch to the easier path.

The experimental setting designed to meet the conditions of the problem was as follows: An elevated, open maze was used.[1] (See Fig. 1.) The easy path W was an open running path blocked at B near the

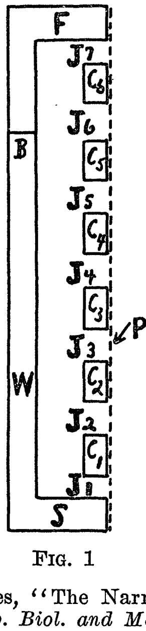

FIG. 1

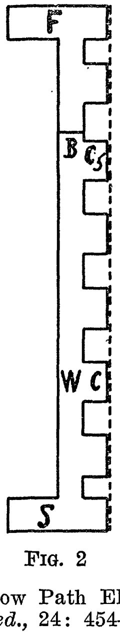

FIG. 2

[1] W. R. Miles, "The Narrow Path Elevated Maze," *Proc. Soc. Exp. Biol. and Med.*, 24: 454–456, 1927.

food box F. This was separated in the initial learning from the true but difficult path C which consisted of a series of jumps from one platform to another. After the rats had learned to take the C pathway to food, the running path W was moved over until it touched the series of C platforms. In this test situation (See Fig. 2) rats therefore had the opportunity to run along W to the block and so on to the fifth platform of C, thus eliminating most of the difficult jumps along the C pathway.

If rats in such a test situation as described above should continue to take the difficult jumping path to food, their behavior could be explained by mechanistic theories of learning. If, however, they should suddenly and immediately choose the easy, running pathway, their behavior could not be so explained. Such behavior would support the striking evidence of Tolman and Honsik[2] that rats are able suddenly to go against previous habit and preference. In the present experiment all rats continued to jump in the test situation and the results therefore tend to agree with a mechanistic explanation of learning.

However, before presenting the results in greater detail, the dimensions of the maze, length of jumps and amount of preliminary training are necessary factors to be considered. Path W was 6 in. wide, 15 ft. long and was blocked at B 11 ft. 6 in. from S, the starting platform. The platforms C_1, C_2, etc., of the C pathway, were 20 in. long, 6 in. wide, and were tipped with rubber on the landing end and screen wire on the jumping end, the latter tips enabling rats to get a good foothold for the jump. The platforms and jumps along C were bordered by a wall, indicated in the figures by the dotted line P. Paths W and C were separated 12 in. during a preliminary training period.

The length of the jumps J_1, J_2, etc., was increased during the training period of 70 trials until on the 70th trial jumps 1, 5 and 6 equalled 10 in., jumps 2 and 4 equalled 16 in. and jump 7 equalled 4 in. Observations of behavior at the jumps indicated that they were made with reluctance. In the last 10 trials of the training all rats took the C pathway in preference to W. They were then tested on the 71st trial.

Results summarized briefly are as follows: Rats (N equals 7) continued to jump in the test situation for from 10 to 20 trials after the paths were moved together. The elimination of the jumps was gradual. Even after full runs along W to B had once been made, all rats persisted in many of the succeeding trials in jumping part or all of the way to platform C_5. This was done despite the fact that complete runs along the short cut W to B and thence to food by C_5 and C_6 averaged 10 seconds, while the average time along the C path was 30 seconds. A final preference for the short cut W was established and thereafter rats never took the C path, except beyond B. There was no indication that any rats "saw" into the short cut W in the test situation.

The experiment is being continued. The writer is planning to use the method as a means of analysis of habit fixation by putting path W adjacent to path C at various stages of training; by introducing in the test a new path, different from W; and by allowing path W to be a true path to food in part of the training period.

Since one interpretation of the results described above might be that running and jumping constitute separate abilities, and therefore are too different to permit a sudden change in habit, it is intended to run a comparison series in which path C consists of a running path containing a number of *cul de sacs*. At the test the two running paths will then be placed together.

Apart from the bearing of the results of this experiment on theories of learning, it would appear that the jumping activity itself should be of interest to comparative psychologists. Lashley[3] recently reported a series of discrimination experiments in which rats were required to jump, but, with the exception of the present work, the writer knows of no attempt to apply jumping to a maze situation. The contrast between running and jumping in the same rats yields sharp, objective differences in behavior and, where such sharp contrasts are needed, the activity should be valuable. It could probably be used as a substitute for some of the "obstruction" methods now in use by extending the jumps beyond the distances used here. It is likely that applications of the activity to other problems might readily be made.

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[2] E. C. Tolman and C. H. Honzik, "Insight in Rats," Univ. Calif. Publ. Psychol., 4: 215–232, 1930.

[3] K. S. Lashley, "The Mechanism of Vision," *Jour. Genet. Psychol.*, 37: 453–460, 1930.

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