appears to be due, largely if not wholly, to failure to standardize experimental conditions so as to isolate the primacy-recency factors. In most cases no adequate control has been had of even the basic matter of settling a problem in which the units of the serial pattern are genuinely comparable in difficulty. The present paper reports the results of an experiment in which this factor has been controlled and special care taken to avoid emotional effects that might enter in to mask possible primacy-recency factors. Results were secured on five serial patterns differing only quantitatively in an additive series (2–4–6–8–10 unit patterns). Since the method employed is analogous or even identical to that employed in testing for primacy-recency effects in connection with human verbal material, the present findings would seem to be of considerable theoretical importance relative to the possibility of an extension of the laws of primacy and recency to serial learning generally.

An Unexpected Cue in Maze Learning. JOHN F. SHEPARD, University of Michigan.

In connection with an extensive study of the factors involved in learning various maze patterns, it became evident that the animals (rats) were using some cue which had not been brought under control. The particular maze pattern concerned in the experiment here reported consisted of a number of like or standard units followed by an exceptional unit in which the reaction necessary to avoid the blind was precisely opposite to that necessary in the standard units. The rats learned the maze easily. Then when they were inserted at various points in the standard unit series they were able, after a brief period of exploration, to orient themselves accurately and locate the exceptional unit with almost no errors. This demonstrates that the standard units were not alike to them, that they obtained some differential cue either from within or without the maze. The maze was illuminated by 100 small shaded lights, 24″ o.c. in each direction, which was also the width of the maze pattern units. There was then little chance for a visual cue, and numerous tests showed that the cue was not visual, olfactory, or kinesthetic-tactual (in the usual sense at least). The maze platform is 2″ thick and is covered with a sort of asphaltic linoleum 3/16″ thick and cut into 12″ squares. Interchange of these flooring sections caused serious disorientation of the animal. When such floor coverings were removed from a portion of the maze and the platform covered with ½″ hair felt, then a soft rubberized sheeting, and over all a good quality of black percale, the rats

behaved as though in an entirely strange situation. On this flooring they were able to learn only one (or at the most, two) standard units followed by the exceptional unit, and were unable to regain orientation if the routine were departed from. The flooring furnishes a very important cue which is, in all probability, of auditory character. This fact has necessitated a repetition of a number of maze patterns with this factor under control. We shall also apply the suggested technique to the general problem of audition in rats.

Effect of Endocrine Substances on Memory Habit in the Rat. WALTER MILES, Stanford University.

These tests on the effects of various endocrine substances, *e.g.*, adrenalin, insulin, pituitrin, have been made by injecting small doses in animals that have already learned an elevated maze involving eight choices. An animal was given one trial on the maze ten to twenty minutes before injection, and then following injection he was given two trials, one while the substance is active and one later, when he has returned to near normal. Results are presented for both blind and sighted adult animals. The blind normally exhibited rather less vigor, that is, poorer physical condition, than the sighted, but both groups were without deficiency diseases. Injection of normal saline solution produces no observable change in the function of the memory habit. The endocrine substances studied up to the present (October, 1928) produce observable changes in the gait, posture, motor coördination, and exploratory tendencies of the animals. These changes are similar for both blind and sighted. They do not function to cause the animal to complete the maze more rapidly or more accurately. On the contrary, adrenalin in very slight dosages causes slower progress in the maze (periods of hesitancy, which may be interspersed with a few fairly rapid steps), more frequent loss of orientation (retracing or entering blinds). Doses of insulin, although creating a greater immediate demand in the organism for food, does not function to the end that the animal goes to the food more promptly, although he eats ravenously when he arrives. These endocrine substances for normal animals interfere with the efficiency of the memory habit. The results are presented in tables and charts.

The Age Factor in Rat Learning. C. P. STONE, Institute for Juvenile Research.

Comparable age groups of rats were trained at various ages beginning with late infancy (twenty-five days), at various stages of