A GENERAL PURPOSE ACTIVITY RECORDER WITH VARIABLE SENSITIVITY¹

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The purpose of this paper is to describe a new and versatile device for recording the activity of animals. This recorder was designed specifically to provide the following features: sensitivity to general activity; minimal activity contingent auditory feedback; digital output for recording simplicity; variable sensitivity; and, most important, day-to-day reliability for long term studies.

The activity transducer in this recorder is a plastic plate resting on three, 1/2-in. balls. The balls are free to roll in loose-fitting flat-bottomed sockets fastened to a supporting base. This arrangement converts the general activity of an animal housed in a cage resting on this platform into lateral movements of the platform. Fixed rods attached to the plate and centered in oversized holes in the base limit excessive displacement.

For long term studies recording by means of fixed contacts was found to be unreliable. A self-centering contact was designed to eliminate this problem.

This contact consists of a small stainless steel weight suspended from a support attached to the plastic plate by a fine flexible plumb line (Surgaloy 5-0). The weight is adjusted to rest in the center of a hole cut in stainless steel sheet metal also attached to the plastic platform. The weight and the sides of the hole in the sheet metal serve as contacts. Figure 1 shows the arrangement. Any movements of the plastic platform briefly displace the hole with respect to the weight, completing the circuit between the weight and the side of the hole. When the platform comes to rest again, the weight returns to its normal

position in the center of the hole. As long as the platform is in motion, the weight bounces against the sides of the hole making and breaking the circuit. Regardless of the violence or duration of its movement, the weight rapidly returns to its center position when movement stops.

By beveling the bottom of the weight and suspending it over a hole slightly smaller than the diameter of its barrel, it is possible to adjust the sensitivity of the recorder by raising and lowering the weight. In order to prevent corrosion from arcing, this switch is connected to a sensitive contact relay (e.g., a Grason-Stadler Drinkometer). Several of these contact

Fig. 1. Complete activity platform and detail of the pendulum contact.

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switches with different sensitivity can be mounted on a single platform.

The principle is general, and can be used for animals of any size. Recorders of this type have been used satisfactorily in long-term studies of the activity of rats, and in recording the random movements of dogs during classical salivary conditioning.

The results shown in Fig. 2 summarize one study designed to test the sensitivity of the recorder and to establish discriminated classically conditioned activity of the rat. Four, 90-day-old male rats were used in a concurrent balanced design. After 24 CS adaptation trials, a 4,500 cps tone was followed by food for two rats; for the other two, food followed a 450 cps tone. The CS duration was 9 sec, with nine 45 mg pellets delivered 7 sec after the onset of the CS. Stimuli were presented hourly in a semi-random sequence.

The graph on the left of Fig. 2 shows acquisition of the discrimination. The ordinate is the difference in counts per second during the CS-US interval and a 3-sec pre-CS control period immediately preceding CS onset. Conditioning proceeds rapidly, and a good discrimination is established after only 25 trials each of CS+ and CS-. The right side of Fig.

Fig. 2. The course of acquisition and last five training trials of discrimination training. Each point represents the mean of four animals.

2 shows the form of the conditioned activity before, during, and after the CS on trials 45 through 50. Activity is low before the onset of the CS, rises rapidly to the onset of CS+ and falls to zero within 9 sec after food presentation. The high activity counts at 11 and 12 sec are due primarily to the feeders which were attached to the sound shielded chambers and shook the activity platforms when they delivered pellets. To CS- a small generalized conditioned response can be seen, but a clear-cut discrimination between the tones is apparent.