one exception (*1*), these samplers have all operated at low flow rates, generally between 5 and 10 cc/min. Although the thermal precipitator is believed to have a very high effectiveness in the collection of small particles from the air, such a low flow rate has greatly limited its use.

As a result of study of the principles underlying the operation of the thermal precipitator (e.g., [*2*]), the members of our group decided that a warm horizontal plate facing downward would be more useful in a thermal precipitator than the hot wire ordinarily used. Since it was desired to design a sampler suitable for use in aerobacteriological studies, the primary objective was to obtain live organisms from the air in such a state that they could be counted and perhaps subsequently classified. With this in mind, several samplers were designed to precipitate airborne particles directly on the surface of Petri dishes, but the irregularity of the dish surface made this impractical. A more uniform surface was obtained by using No. 2 cover slips of 3-in. diameter (obtained from C. A. Hausser & Son). The sampler shown in Figs. 1 and 2 was designed to precipitate airborne particles and bacteria on the surface of such cover slips.

The details and operation of this thermal precipitator are rather simple. Fig. 1 shows the assembled sampler: The top tubes are for the passage of the air sample, which enters the larger center tube and leaves through the smaller offset tube. The two lower tubes are for the passage of water through the lower chamber in order to cool the cover slip. In Fig. 2 the sampler is shown disassembled; the round objects in the foreground are the three spacing shims, which are 5, 10, and 15 thousandths in. thick. When one of these is inserted into the sampler, it determines the thickness of the space between the hot and cold surfaces. In operation, the desired temperature of the hot body is obtained by adjusting the voltage of a variable transformer connected to the lugs on the upper plate (which is a commercial heating element). In general, temperatures between 80° and 100° C have been used for the upper plate; tap water or water cooled a few degrees is passed through the lower chamber. With a cover slip in the cavity of the lower half of the sampler and the proper shim in place, the sampler is then assembled and the wing nuts are screwed firmly down to insure airtight seals. The air sample can then be drawn through with any convenient device.

The unit is undergoing tests at the present time, and results thus far obtained indicate that it is effective at flow rates as high as 400 cc/min, and that particles suspended in the air sample are uniformly precipitated over the surface of the cover slip on which they are collected. The area covered by the particles on the slip depends on the flow rate, the distance, and the temperature difference between the hot and cold surfaces.

Because there have been so many inquiries and so much interest expressed by other groups working in related fields, we feel that the publication of a short description of this thermal precipitator is warranted at this time, even though we have not completely proved its effectiveness. The advice and guidance of J. M. DallaValle in this work is gratefully acknowledged. The investigations leading to the designing of this sampler were supported in part by a grant-in-aid from the National Institutes of Health.

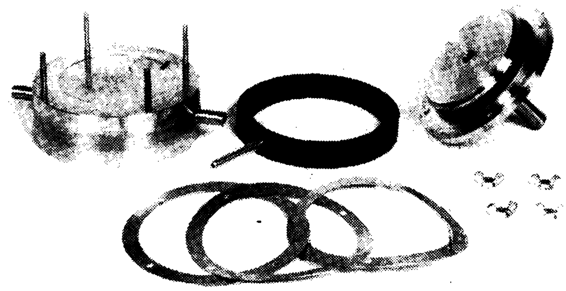

FIG. 2.

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An Activity Analyzer for Small Animals[1]

INTEREST in the spontaneous and drug-induced activity of mammals has stimulated the development of numerous devices to record their motion (*1–15*). The so-called activity cages, with two exceptions (*12, 15*), are either modifications of Stewart's revolving cage (*1*) or variations of Szymanski's "aktographs" (*3*). The cage described here belongs to the latter class and was designed for rats. It is simple, compact, and sensitive. Four units may be arranged to record on one drum of a kymograph, and their sensitivity may be regulated to register movements ranging from respirations to jumps. Patterns for crawling, walking, staggering, jumping, and numerous other motions may be readily ascertained, as well as the total amount of activity.

The unit shown in Fig. 1 is made of appropriately braced, galvanized hardware cloth of ½″ mesh except for the bottom, which is ¼″ mesh. Its diameter and height are each 7″. The guide wires *D*, which are soldered to the center of the bottom of the cage, are made of 1/16″ brass stock and project perpendicularly to describe a rectangle approximately 8″ × 2″. Attached to the bottom of the cage, equidistant from the guide rods is a pole *C* made of ⅛″ aluminum rod, which extends 9″ past the edge of the cage. The top *A*, with its 50-ml watering tube, is attached to the cage by removable spring clips *B*. In action the cage is suspended from a spring. At rest it is supported by a 7″

[1] Published with the approval of the director of research, James H. Williams.

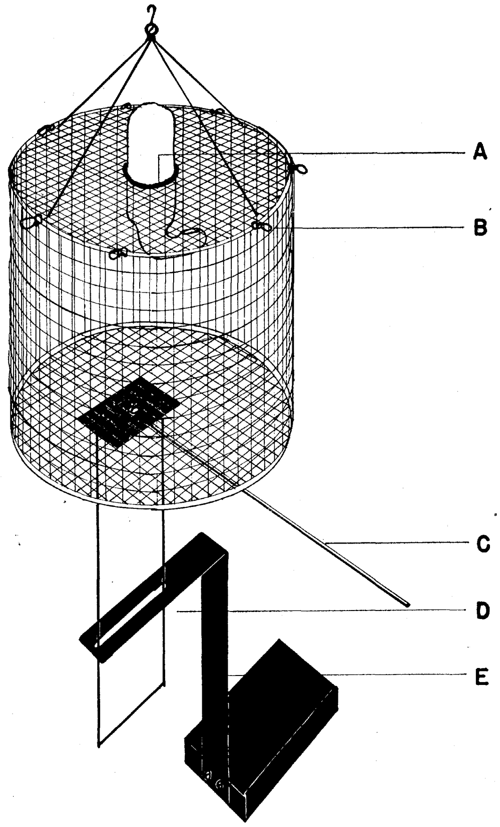

FIG. 1. Activity cage.

iron ring from which a 4″ segment has been removed to permit passage of the guide wires *D*. The guide *E* consists of an L-shaped brass arm, ¾″ wide and ⅛″ thick, attached to a heavy base. The horizontal member of the arm is 4″ long and slotted to admit the guide rods with a minimum of play. The vertical portion is 7½″ high. The steel base is 2″ × 3″ × ⅞″, making the total weight of guide *E* about 725 g; however, this is supplemented with an additional kg of lead. The spring is made of music wire, 0.028″ in diameter and wound into ½″ coils approximately 8 turns/in. The usual length is 12″. Movements of the cage are transmitted by a silk thread that runs from the end of pole *C* through one or two guides to an appropriately weighted heart lever equipped with a wooden stylus. A Gibbs adjustable writing point (*16*) records the movements of the cage on smoked paper.

The tracings shown in Fig. 2 cover a period of approximately 1½ hr and were made by male rats weighing 120–150 g. The sensitivity of each unit was adjusted to record all movements of a greater magnitude

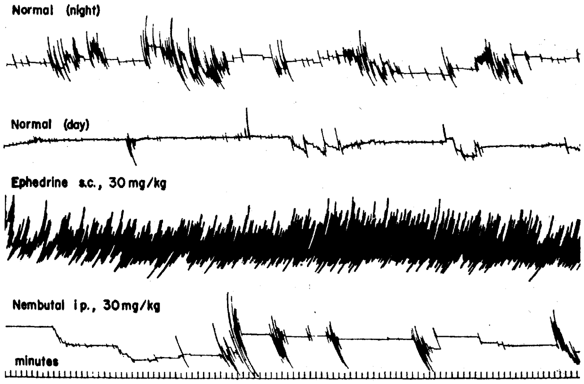

FIG. 2. Characteristic activity records from rats.

than those of normal respiration. Each deviation from the horizontal indicates activity; a small vertical line denotes a minor movement, a change in the level signifies movement to a new location in the cage. If movement to a different part of the cage is effected by a cautious crawl, the vertical lines are short; if the rat walks in a normal manner, the vertical lines are longer; and if the animal staggers, falls, or jumps, a long, sweeping arc results. The tracings show the marked contrasts between the normal night and normal day records, and between them and the ephedrine and nembutal tracings.

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