The sodium chloride-treated animals continued to have access to the NaCl solution, the rest of the animals were given tap water to drink. Four hours before sacrificing, the animals were given 1.2 g glucose (5 cc of a 25% solution) by stomach tube. The animals were anesthetized with sodium amytal, the tissues removed immediately and the following determinations made: intestinal absorption of glucose; blood sugar; liver glycogen and muscle glycogen. The results of this study are shown in Table II. It will be noted that the values for the glucose absorption and the carbohydrate levels in the blood, liver and muscle are very much the same in the first 3 groups which shows that the salt-treated adrenalectomized rats are able to absorb and store fed glucose as well as the adrenalectomized rats which were treated with a half milligram dose of desoxycorticosterone daily, and as the rats with their adrenals intact. On the other hand the untreated adrenalectomized rats of Group IV showed liver glycogen stores greatly reduced as early as the 4th day post-operative.

Summary. Adrenalectomized rats given a 1% solution of sodium chloride to drink *ad libitum* in place of tap water for a 10-day period after operation gain in weight and are able to store fed glucose in amounts comparable to that of adrenalectomized rats given 0.5 mg desoxycorticosterone daily or to that of rats in which the adrenals are intact.

11200

A Modified Hemmingsen-Krarup Mammalian Activity Recorder.*

ORLANDO PARK AND L. P. WOODS. (Introduced by C. D. Turner.)

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Studies in mammalian activity have made necessary the development of recording equipment.[1] Most of these recorders have been simply constructed, utilizing rubber bands, springs or excentric drives. The Hemmingsen-Krarup recorder[2] is an apparatus of considerable precision and a modified form of this equipment has been developed for the study of periodic activity of small mammals.

* Recording apparatus constructed by C. P. Clare & Co., Chicago, by means of a grant from Northwestern University.

1 Park, O., *Ecological Monographs,* 1940, **10** (July).

2 Hemmingsen, A. M., and Krarup, N. B., *Biologiske Meddel.,* 1937, **13**, 1.

This recorder is depicted in the photographs (Figs. 1, 2) and may be described as follows. The machine consists of 3 main parts: (1) An upright plywood partition (35″ x 34″) for support of the revolving cage, living cage, and mechanism for gearing down and recording activity. (2) The revolving cage (26″ diameter x 8″ deep) constructed of quarter-inch mesh wire on circular plywood back. (3) Living cage (23″ x 6″ x 14″) hinged to the vertical partition at one end and suspended by a spring, attached to the kymograph bracket at the other end. Living cage and revolving cage are in communication by an opening (4″ diameter) cut through the vertical partition.

The gearing mechanism noted above may be described as follows: The revolving cage turns on a ball-bearing racing bicycle axle which has a double excentric on one end. One of these excentrics is connected with a notched sprocket arm which turns a cyclometer fastened on a vertical partition. The second excentric works upon a reduction gear, the periphery of which has 250 teeth. This gearing wheel in turn carries an excentrically attached, adjustable rod and

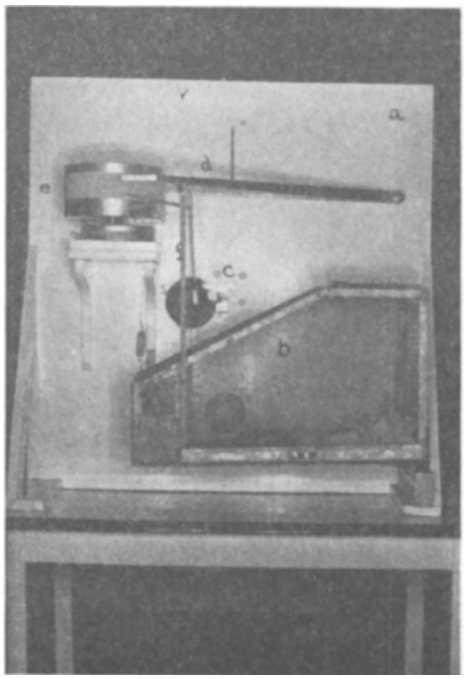

FIG. 1.

Activity recorder: front view. a. Vertical partition; b. Living cage; c. Reduction gear, sprocket arm and cyclometer assembly; d. Recording lever; e. aluminum drum and clockworks; f. Auxiliary lever recording activity in living cage.

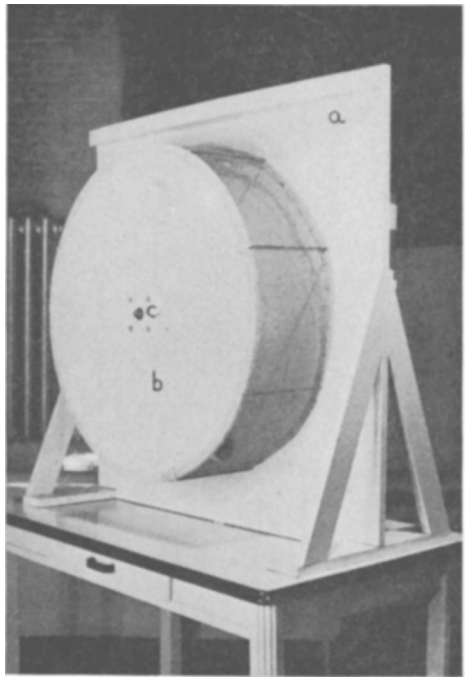

FIG. 2.
Activity recorder: rear view. a. Vertical partition; b. Revolving cage, note circular aperture passing through upright partition and giving access from living cage (Fig. 1) to revolving cage; c. Hub of racing bicycle axle passing through partition to cyclometer assembly.

this rod moves the recording lever in a vertical plane. The recording lever completes a single vertical movement for every 125 revolutions of the revolving cage, or a single complete peak for every 250 revolutions. This worked out at 34 feet traveled by the revolving cage for every millimeter of vertical movement by the recording stylus.

The activity record is made by a spring steel point on the recording lever, writing upon a waxed-paper record. This waxed paper gives a perfect account of the revolving cage, and is carried on an aluminum drum (8″ diameter) revolving once in 24 hours through the agency of a Taylor clockworks. Any activity in the living cage is also recorded on the waxed-paper record. This is accomplished by means of an auxiliary, adjustable recording stylus attached to the free-swinging, spring-suspended end of the living cage. Consequently, activity of the experimental animal is recorded either while moving in the revolving cage, or while eating, drinking, *et cetera,* in the living cage. The axle of the revolving cage is covered by a sheet iron gable

guard which prevents the animal from sitting on the axle and rotating the revolving cage.

This recorder was planned in the autumn of 1938, and was ready for service in February, 1939, and has proven accurate and reliable. The following sample brings out the diurnality of a small mammal, held under controlled conditions for 44 days and nights. The chipmunk (*Tamias striatus griseus* Mearns) was used. The recorder was placed in an insulated cabinet, in which the air temperature varied between 71°-73°F for the length of the experiment. Air in the cabinet was slowly changed by a light-tight ventilating pipe attached to an electric fan. Relative humidity varied between 64%-68%, and the recorder was in total darkness throughout the experiment save for a 10-minute interval each 24 hours at which time the waxed-paper record was changed and food and water supply replenished. No adjustments of the apparatus were necessary and the living cage was not cleaned during the experiment so that the animal was not disturbed.

Under these conditions of constant darkness, temperature and humidity the activity was analyzed, and the diurnality is demon-

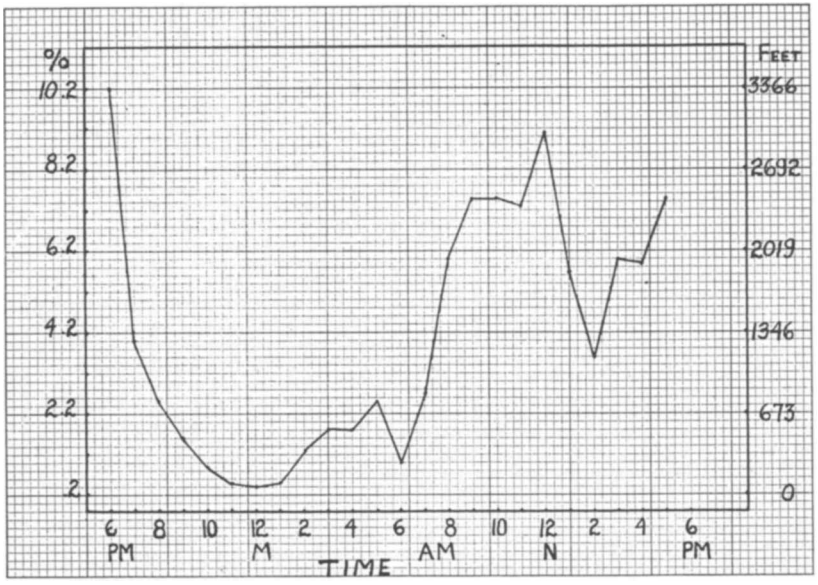

FIG. 3.

Average hourly activity of the chipmunk *(Tamias griseus)* for 44 days and nights in approximately constant temperature, relative humidity and total darkness. On left read hourly average expressed as the percentage of the total 24-hour average activity (approximately 18% of total experimental activity in revolving cage between 7 p.m. and 6 a.m. and 82% between 7 a.m. and 6 p.m.). On right read average number of feet traveled in the revolving cage.

strated in the average activity graph (Fig. 3) of a single female chipmunk from May 17 to June 29, 1939. Complete analysis of the activity of the species cannot be given here, but the activity curve shows that the species is diurnal with activity largely during the period between 6 a. m.-noon, and 2-6 p. m. This coincides with field observation. Analysis of activity by weeks shows that total average activity tends to increase and the periodicity to break down through the experimental time, thus average activity for the first week was much less, and confined to the day, no activity being recorded between 8 p. m.-6 a.m. During the course of this sample experiment the chipmunk traveled an average of 6.2 miles per 24-hour period, or a total of 272.8 miles. The cyclometer reading at this time was 272.6 miles, a difference of .2 miles between the direct count on the revolving axle, and the waxed-paper record, attesting to the accuracy of the apparatus. Such a recorder should be valuable for analysis of small mammal activity cycles in general.

Summary. A modification of the Hemmingsen-Krarup activity recorder is described and figured. In a test of the apparatus, the chipmunk was found to have at least an habitual diurnality in constant darkness, temperature and relative humidity.

11201

Effects of Adrenalectomy on the Blood Count of the Rat.

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Study of the literature concerning changes in the blood picture during adrenal insufficiency reveals that the results reported by different workers are not in complete agreement. While the experiments of Corey and Britton[1] show an increase in the red cells and lymphocytes, accompanied by a decrease in the neutrophiles, those of Simpson, Dennison and Korenchevsky[2] show a decrease in the red cells and lymphocytes with not much change in the total white cell count, whereas the effects observed by Shecket, Friedman and Nice[3] were leukocytosis, lymphocytosis and neutropenia.

1 Corey, E. L., and Britton, S. W., *Am. J. Physiol.*, 1932, **102**, 699.

2 Simpson, S. L., Dennison, M., and Korenchevsky, V., *J. Path. and Bact.*, 1934, **39**, 569.

3 Shecket, H. A., Friedman, D. L., and Nice, L. B., PROC. SOC. EXP. BIOL. AND MED., 1935, **32**, 608.