and the micronuclear structure of the "aurelia type," but possessing several (three to eight) micronuclei. In brief, the organism is essentially identical in form and structure with P. *calkinsi,* but has more than two micronuclei. Thus from the standpoint of micronuclear structure and number this animal holds the same position in the "bursaria group" as *P. multimicronucleata* in the "aurelia group."

Pedigree cultures from the original animal found have now been under observation and experimentation for nearly four months, and through upward of one hundred and fifty generations. During this time the animals have bred true, exhibiting the characteristic micronuclear number after emerging from the nuclear reorganization involved in endomixis.

In view of all the above data the animals of this culture are designated a new species, *Paramecium polycaryum.*[2]

164 (2124)

The effect of iletin (insulin) on the blood sugar content in adrenalectomized animals.

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The existence of a close relationship between the adrenals, especially the medulla, and the pancreas in the regulation of the carbohydrate metabolism has been assumed by various writers. It seemed therefore of interest to determine whether the action of insulin on rabbits which had survived total adrenalectomy differed from its action on normal rabbits. No difference was made out. The adrenals were removed in two operations. The second adrenal was excised 3 weeks to 8 months before the insulin experiment. Six to eight blood specimens were obtained

2 Details of the structure and life history of *P. polycaryum* will appear in the *Biological Bulletin.*

at intervals during 4 to 6 hours after subcutaneous injection of insulin. The blood sugar followed the course described by Macleod and his collaborators in normal rabbits, falling from initial values of 0.10 to 0.11 per cent. to a minimum of 0.039 to 0.048 per cent. (Folin-Wu method). When convulsions occurred, or the animal became comatose without going into convulsions subcutaneous injection of dextrose had the same markedly beneficial effect as in the normal control animals. Usually there was some rise in the rectal temperature (as much as 1.5° C. in a case where the animal became comatose without convulsions, and 2° C. in a case where convulsions occurred and dextrose was injected).

If the internal secretion of the pancreas and the internal secretion of adrenal medulla both take a share in the regulation of the blood sugar content (perhaps, as some have supposed, by exerting actions more or less antagnostic) it might appear not unlikely that each would influence the secretion of the other. We have accordingly made some experiments on the influence of insulin upon the output of epinephrin in the cat, in which animal the blood sugar curve after insulin runs much the same course as in the rabbit. Neither with subcutaneous nor with intravenous injection of insulin was any decided effect produced upon the output.

As evidence in favor of a relationship between the adrenals and the pancreas, it has been stated that after removal of the adrenals complete pancreatectomy does not produce hyperglycemia. This statement is based upon observations made on practically moribund animals. Dogs after complete pancreatectomy without interference with the adrenals show a hypoglycemia some time before death. Certainly the epinephrin from the adrenals has nothing to do with the development of hyperglycemia after pancreatectomy. The right adrenal was excised and the left denervated in a dog, and a month later total pancreatectomy was performed. The animal showed the typical picture of pancreatic diabetes, with blood sugar as high as 0.29 per cent. Two weeks after the pancreatectomy the left adrenal was removed. A few hours before this operation the blood sugar was 0.286 per cent.; 18½ hours after the operation it was 0.288 per cent.; 7 hours later 0.216 per cent. Two days after the operation it was only 0.08 per cent. and next day the animal was dead. In

this animal, 3 days after removal of the pancreas an experiment was made to determine whether insulin would affect the blood sugar content in the ordinary way in a dog whose epinephrin secretion was suppressed. The course of the blood sugar curve under the influence of insulin was the same as in a pancreatectomized animal not subjected to the adrenal operation (initial blood sugar 0.227; minimum reached in 4¾ hours 0.063 per cent.).

165 (2125)

The influence of iletin (insulin) on morphine hyperglycemia.

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It has been shown by Macleod and his collaborators that insulin prevents the development of the hyperglycemia caused by etherization, asphyxia, carbon monoxide and piqûre, or counteracts it if already present. We have demonstrated that while these forms of experimental hyperglycemia are not essentially related to the adrenals, since they can be well elicited in the absence of those glands, this is not the case with the hyperglycemia produced by morphine in the development of which the adrenals seem to intervene in some way. We have therefore tested the influence of insulin upon morphine hyperglycemia in rabbits and cats. Whether morphine was given before, after, or at the same time as insulin, the characteristic effect of insulin upon the blood sugar was always observed. Thus, in a rabbit to which morhpine was administered 1 hour before insulin the blood sugar, which was 0.083 per cent. at the beginning of the experiment and 0.093 an hour after morphine, was 0.047 per cent. an hour after insulin had been injected. The morphine hyperglycemia had not had time to develop before insulin was given, nor did it develop in the 6 hours over which blood samples were collected. In another rabbit morphine was given an hour after insulin when the blood sugar had already fallen from 0.115 to 0.068 per cent.