SCIENTIFIC PROCEEDINGS.

ABSTRACTS OF THE COMMUNICATIONS.

Forty third meeting.

The Laboratory for Hygiene, University of Pennsylvania. April 19, 1911. President Morgan in the chair.

50 (575)

On the regular seasonal changes in the relative weight of the central nervous system of the leopard frog (R. pipiens).

By **HENRY H. DONALDSON.**

[*From the Wistar Institute of Anatomy and Biology.*]

The relative weight of the central nervous system of the frog, *Rana pipiens*, changes during the active season, and such a change is probably characteristic for other species of frogs with like habits.

The relative weight of the central nervous system is low at the time of emergence, high in the midsummer (July) and low again at the time of hibernation. During hibernation it remains nearly constant. In the formula[1] used to express the weight of the central nervous system, the absolute value of C is characteristic for the station from which the frogs come.

The range from minimum to maximum in the value of C is about 13 per cent., rising 7 per cent. from the end of March to the end of April, 4 per cent. more from the end of April to the end of May, and 2 per cent. more from the end of May to the first of July, remaining stationary in July and then falling month by month at a similar rate to the end of October.

This variation in the relative weight according to season is due to lack of coincidence between the growth of the central nervous system and the growth of the entire body.

[1] This formula is as follows: Weight of C. N. S. = (log. $W.\sqrt[4]{L}$.) C indicating that the weight of the central nervous system is equal to the log. $W.$, body weight in grams, by $\sqrt[4]{}$ of the total length L, in mm., this product to be multiplied by C, a constant.

In frogs from one to four years old, the body weight more than doubles during each active season, although the precise form of the curve representing this body growth is not known.

The growth of the central nervous system is precocious in relation to that of the body, but in the absence of direct observations on the growth of the body, the form of the curve can only be indirectly determined.

During the active season, the percentage of water in the entire frog falls slightly from spring to summer and rises again from summer to autumn. These changes seem to be due to the combined effects of advancing age and varying food supply.

51 (576)

An interpretation of growth curves from a dynamical standpoint.

By **S. HATAI.**

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The growth phenomena may be considered as a gradual transformation of growth energy to the work done in forming the mass which composes the body. The present writer wishes to determine "what law, if there is any, governs in any individual the rate of transforming the growth energy into the work done."

In order to solve the above problem, the assumption was made that under normal conditions the growth energy is transformed into the work with least loss of energy. It was shown that in order that this assumption should be true we must have $\delta A = 0$ in the following integral

$$A \text{ (action)} = \int mvds.$$

Applying this principle it was proved that the formula for the growth of brain in weight (and any other data which satisfy the same conditions) must be a function which renders the following integral minimum

$$u = k\int\left(\frac{1}{x} + \frac{1}{a}\right)\sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx.$$

The integral is minimized when the function y has the following relations: