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The reactions of the melanophores of amblystoma larvæ.

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The reactions of the sub-epidermal melanophores, in intact and in isolated pieces of skin, to various stimuli,—light, temperature, solutions of various salts and drugs and electric currents—were studied.

The melanophores of normal and eyeless larvæ[1] react to light by expanding, and to darkness by contracting. If the normal larvæ are, however, kept in bright diffuse daylight on an indifferent background for more than 3 to 5 days the melanophores secondarily contract. Likewise if they are kept in darkness for more than 5 days the melanophores secondarily expand. These secondary responses are lasting and are not shown by the melanophores of eyeless larvæ.

When larvæ are blindfolded, instead of their eyes being removed, the melanophores react to light like those of blinded individuals, that is, they expand and remain so; but they react to darkness like those of normal seeing larvæ, that is, they at first contract, but after 5 days or more they expand.

The melanophores of isolated pieces of skin do not react to daylight, to the light from a Nernst glower, or to darkness. The light from an arc lamp, however, causes them to contract.

From an additional series of experiments on larvæ in which the central nervous system had been partially or totally destroyed it is apparent that the primary responses of the pigment cells to light and darkness are caused essentially by direct stimulation. The secondary responses of the seeing larvæ are, on the other hand, due to nervous activities set up by the stimulation of the retinæ, the stimulation of sensory nerve endings in the skin playing no part.

A high temperature (above 38°) causes the melanophores to

[1] The optic vesicles were removed from the larvæ at the stage of development when the tail bud is just appearing (see Laurens, *Jour. of Exp. Zool.*, XVI, 2, p. 195, 1914).

contract, a low temperature (below 12°) causes them to expand, both in the intact skin and in isolated pieces. These high and low temperatures inhibit the effects of light and darkness respectively. Intermediate high temperatures (above 32°) hasten the rapidity of the contraction and retard that of the expansion of the melanophores, while intermediate low temperatures (between 12° and 17°) have the opposite effects.

Chloretone (0.02 per cent. and 0.01 per cent.) causes the melanophores in the intact skin and in isolated pieces to expand. Curare (0.2 per cent. and 0.1 per cent.) and atropin sulphate (1 per cent.) have the same effect when larvæ are placed in them, but have no effect on the melanophores of isolated pieces of skin.

The injection of a 1 per cent. solution of curare into the body cavity does not affect the primary responses of the melanophores to light and darkness, although the larvæ are rendered immotile, nor does the injection of a 0.01 per cent. solution of nicotine have any effect. On the other hand the injection of a 1 per cent. solution of strychnine causes the melanophores to contract.

An induced current causes the melanophores of normal larvæ, of larvæ in which the central nervous system has been destroyed, of excised portions of the body and of isolated pieces of skin, to contract. A constant current causes them to expand.

The melanophores of *Amblystoma* larvæ do not change their state after the death of the animal, and there is no center for the contraction and expansion of the pigment cells. Nevertheless, the melanophores are under both spinal and sympathetic nerve control as is shown by experiments on larvæ the nervous systems of which were variously operated upon.