

REACTIONS TO LIGHT AND PHOTORECEPTORS OF  
LUMBRICUS TERRESTRIS.

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It is generally known that earthworms are sensitive to light, but comparatively little is known concerning the nature and distribution of the photoreceptors.

It has been shown by numerous workers that worms of this species are negative to all ordinary intensities of light. In fact, the nocturnal habits of these animals indicates that they can distinguish between light and darkness, and since they are nocturnal in habit they must be negative in their normal reactions to light of the intensity of daylight.

Although lights of ordinary intensities cause these animals to react negatively, lights of very low intensities have an opposite effect. When normal worms were exposed to a light of about .00118 meter candle power, which was covered by a yellow glass, the worms were no longer negative but showed a definite majority of positive reactions. These positive reactions to very weak lights are certainly in keeping with the nocturnal habits of these worms.

Injury to the brain by removal, by removal of one lobe, or by severing the circumesophageal commissures, resulted in these worms losing their power to react negatively. In fact, under such conditions these worms are fully as strongly positive as normal worms are negative.

If the ventral nerve cord of an earthworm is severed, as between segments four and five by a slight ventral incision, the animal is now really physiologically double so far as its reactions to light are concerned; the first four segments being definitely negative and those caudal of segment four are definitely positive.

These results show that the seat of negative reactions resides in the brain and when this center is injured or destroyed the worms no longer respond negatively but become positive in their reactions to ordinary lights.

Now let us turn our attention to other experiments in order to discover if possible the regions of the body that are most sensitive to light, for the purpose of determining the distribution and nature of the photoreceptors.

By the use of ordinary illumination it is possible to demonstrate that worms of this species are most sensitive to light in their anterior regions, somewhat less in the posterior and least of all in the middle portions of their bodies.

By means of a strong pinhole light, the prostomium and the three anterior segments were found to be most sensitive, of which the prostomium appeared to be slightly more sensitive than the rest. Although all segments were found to be photosensitive, each segment, with the possible exception of the first three and the last one or two, was most sensitive in the middle portion of the dorso-lateral region. No reactions were obtained by illuminating the mid-dorsal areas except those of the twelve anterior and the three posterior segments. The

worms did not react to illumination on the mid-ventral surface except on the three anterior and the last segment.

Some of these conclusions were confirmed by tests made, following the removal of certain anterior segments and certain parts of the nervous system.

A comparison of the histological structure of the more sensitive with the less sensitive regions, revealed the fact that a rather peculiar type of sense-cell is more abundant in the former than in the latter areas. This indicates that these sense-cells are photoreceptors.