THE NATURE OF RESPONSE TO LIGHT IN AMOEBA PROTEUS
(LEIDY)\(^1\).

By

S. O. MAST.

With 2 figures in the text.

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Introduction.

It is well known that if Amoeba proteus is subjected to rapid increase
in illumination, movement usually stops and that if it is exposed in a
horizontal beam of strong light it usually orients. There thus appear to
be two radically different types of response to light, shock-reaction and
orientation\(^2\). These two types of response are, however, in all probabil-
ity fundamentally the same. Both are directly correlated with retarda-
tion in or prevention of the extension of pseudopods; and there is some
evidence indicating that this is due to localized increase in the consistency
and the elastic strength of the plasmagel produced by rapid increase in
luminous intensity (Mast '10, '26; Luce '26).

The observations considered below have a direct bearing on this
problem. They concern primarily the nature of the response in Amoeba
to rapid increase in illumination.

In these observations attention was, under high magnification,
focussed upon changes in the rate and the direction of streaming in the
plasmasol in different parts of the organism, after it had been subjected
to increase in illumination which in different tests varied greatly in rate
and in magnitude. In this way specimens from cultures which differed
radically, were studied in various solutions.

Variation in Response to Light.

The response observed under different conditions varied greatly.
Under some conditions it consisted of merely a slight momentary local
decrease in the rate of streaming, under others it consisted of total

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\(^2\) Responses dependent upon the rate of change in intensity of the stimulat-
ing agent are usually called shock-reactions.
cessation in streaming throughout the entire organism, and under still others it consisted of various series of phenomena. One of the simpler of the series observed is illustrated in figure 1, and one of the more complex in figure 2.

The amoeba represented in figure 1 had several long pseudopods, one of which was advancing rapidly when the illumination was increased (Fig. 1, a). A few seconds later streaming ceased at the tip of this pseudopod (Fig. 1, b), but only for a few moments after which it began in the reverse direction, ceasing at the same time a little farther back

![Fig. 1. A series of sketches illustrating processes observed in a pseudopod in the response to rapid increase in illumination. s, plasmasol; g, plasmagel; h, hyaline cap; arrows, direction of flow in the plasmasol; x, regions at rest. Note that the response begins by cessation in streaming at the tip of the pseudopod immediately back of the hyaline cap and continues by cessation farther back accompanied by streaming in the reverse direction at the tip.](image)

(Fig. 1, c); then cessation and reversal gradually moved toward the base of the pseudopod. In the meantime, however, there appeared in the region of cessation an enlargement which was produced by aggregation of hyaline fluid under the plasmalemma (Fig. 1, d). Small granules later appeared in this fluid. It was in all probability squeezed out of the plasmagel or the plasmasol, or both. Other similar enlargements appeared later, giving the entire surface of the pseudopod a wrinkled appearance (Fig. 1, e). This wrinkling, however, was confined to the plasmalemma. The plasmagel was not wrinkled but the pseudopod had decreased considerably in length and the plasmagel tube had also apparently