REVERSAL OF PHOTOTROPISM IN DIEMYCTYLUS VIRIDESCENS.

By T. J. B. STIER.

(From the Laboratory of General Physiology, Harvard University, Cambridge.)

(Accepted for publication, February 1, 1926.)

It has been known that the newts of *Diemyctylus viridescens* are phototropic. Pearse (1909–10) states that the land form is positively phototropic; Pope (1924) and Reese (1917) give evidence that the water form is also phototropic.

When testing the phototropism of *Diemyctylus* it was noted that the characteristic phototropic behavior was different when freshly collected animals were compared with those which had been kept without food in a terrarium or starved for 4 days in a glass jar. The variation of these three lots is expressed in percentages in the following table:

<table>
<thead>
<tr>
<th></th>
<th>No. tested</th>
<th>Positive</th>
<th>Negative</th>
<th>Indifferent to light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshly collected</td>
<td>42</td>
<td>42.8</td>
<td>9.5</td>
<td>47.6</td>
</tr>
<tr>
<td>In terrarium, 2 wks</td>
<td>41</td>
<td>9.7</td>
<td>65.8</td>
<td>24.3</td>
</tr>
<tr>
<td>Starved in glass jar</td>
<td>9</td>
<td>11.1</td>
<td>77.7</td>
<td>11.1</td>
</tr>
</tbody>
</table>

From these results it is apparent that for freshly collected animals the positive response, or indifference to light, was characteristic; whereas for starved animals the negative reaction was predominant. The animals were started creeping under faint red illumination and after progressing about 10 cm. a beam of white light was admitted perpendicular to their path. The newts then either moved definitely away from the light, turned towards the light, or continued straight

1 These observations were made in Pike County, Pennsylvania, during the summer of 1925. I wish to acknowledge assistance from Mr. A. Foote in obtaining the observations.
ahead. The trail along which the animals walked was 42 cm. from the center of the filament of a 2.5 volt, 1/4 ampere, flashlight bulb. At the observation point the intensity of the light was about 11.3 m.c. Each animal was tested but once. Pearse (1909-10) tested each animal about twenty times by placing it in a beam of light and then noting its reaction.

Thus it seemed that there was perhaps some relation between starvation and the occurrence of negative phototropism; or, to reverse the analysis, between feeding and the abolition of negative phototropism. Thinking that there might be some likeness between this case and the case of Limax, whose negative phototropism is temporarily suppressed by certain types of feeding (Crozier and Libby, 1925), Diemyctylus which had been tested for phototropism were dissected and the contents of the alimentary tract examined.

In the course of the summer the stomach contents of over 40 tested animals were examined. Records showed that 80 per cent of all the positively phototropic animals had full stomachs, and that 100 per cent of the negatively phototropic animals had the alimentary tract empty. However, in animals which were indifferent to light the stomach contents were either in a complete state of digestion and the intestine was full; or the stomach was empty and the intestine and cloaca showed evidence of recent feeding.

The dissections therefore clearly indicated that an empty alimentary tract accompanied a state of negative phototropic behavior, and that presence of food in the stomach was correlated with positive phototropism.

In order to further test this relationship, 19 animals were starved in glass containers for 5 days. After being dark-adapted for 2 hours they were tested for phototropic reaction. They gave the result characteristic for starved Diemyctylus—68 per cent were negative, 10 per cent positive, and 22 per cent were indifferent.

Each animal which gave the negative reaction was then fed two larvae of a common red ant. The larvae were put into the esophagus with forceps. It had been observed while dissecting the newts that ant larvae made up the greater bulk of their food. After 1 hour in the dark room these fed newts were again tested—33 per cent were negative and 66 per cent were indifferent. When they were tested 3 hours after feeding, however, all were indifferent to light.
SUMMARY.

In its response to light of approximately 11.3 m.c. intensity _Diemyclylus viridescens_ may be either positive or negative. Negative phototropism is characteristic of animals from which food has been withheld. Feeding suppresses this negative phototropism.

CITATIONS.