

Nature of Pigment in Intestine of the Marine Worm *Chaetopterus*.

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While at Woods Hole one of us (Alvarez) became interested in the green color of the intestine of the otherwise white *Chaetopterus*. On turning to the article by Enders¹ it was found that doubt still exists as to the nature of the pigment: some have thought it to be biliverdin, others have assumed it to be chlorophyll, and others have been so sure that it is not chlorophyll that they have dignified it with a special name, chaetopterin. It seemed worth while to settle the question because if the pigment should be biliverdin, the animal might be valuable for studies on bile formation.

The digestive tracts from several worms were accordingly extracted with alcohol and determination made by one of us (Sheard) of the percentage transmission of light of various wave lengths (from 700 $m\mu$ to 430 $m\mu$) with a Keuffel and Esser color analyzer (spectrophotometer). The transmission curves (Fig. 1) obtained from the unknown pigment and from solutions of chlorophyll from the fresh stems of buckwheat, leaves of bean plants and grass were so similar as to warrant the statement that the absorption bands (zones) were produced in all cases by the same pigment or pigments, that is, by chlorophyll *a* or chlorophyll *b* or both. The most pronounced absorption zone in an alcoholic solution of chlorophyll has its maximal point at about 660 $m\mu$. This band is common to all the curves of Fig. 1 irrespective of the source of the coloring material or degree of dilution of the solution. Curve 2 was obtained from an alcoholic extract of the stems of buckwheat, the solution being of such a concentration as to reproduce as nearly as possible Curve 1 (alcoholic extract of chaetopterus), both in respect to the number of absorption zones and their degree of absorption. Curve 3, obtained with a highly dilute alcoholic extract of fresh leaves from a bean plant, is included to show the marked effects of dilution of the solutions on the spectrophotometric curves. Extracts of chaetopterus and of buckwheat, when sufficiently diluted, gave spectrophotometric curves similar to Curve 3, that is, with pronounced absorption zones in the orange-red and blue-violet, but none in between.

On making a histologic study of the material it was found by one of us (Higgins) that the green matter had permeated the tissues to such an extent that it was hard to be sure of its original site. How-

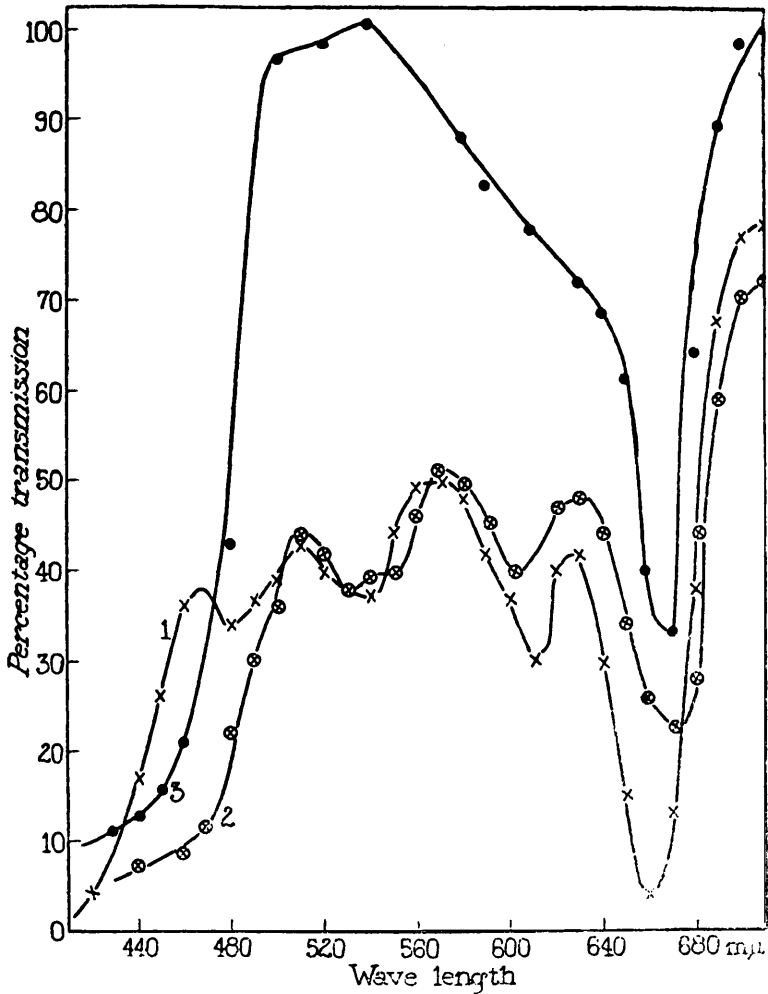


FIG. 1.

Spectrophotometric determinations of alcoholic extracts of (1) chaetopterus, (2) buckwheat, (3) bean.

ever, scattered through several fields there were single cells resembling protophytes, and in many places, there were what appeared to be large colonies of the organism. These invaders were not always within the tissues but sometimes were in the lumen of the bowel where they may have been thrown by the disintegration of some of the cells. The impression left was that the green structures are primitive plants living in symbiotic relationship with the worm, and this agrees with the conclusion of others who have studied the problem.²

¹ Enders, H. E., *J. Morphol.*, 1909, **xx**, 479.

² Geddes, Patrick, *Quart. J. Microsc. Sc.*, 1879, **xix**, 434.