

attain the value of a distinct individual, as compared with the fission in other annelids (*Dero*, *Aeolosoma*), but the entire process is more like the sexual fragmentation described for the Palolo worm.

*Metamerism of the Leech.* W. E. CASTLE.

Following Gratiolet, most students of leech metamerism regard the annulus which bears the metameric sense organs as the first (most anterior) annulus of the somite. Careful study shows, however, that the sensory annulus is really the *middle*, not the most anterior ring of the somite.

The true limits of the somite are indicated by the distribution of the metameric nerves, all the annuli of a somite being innervated from one and the same ganglion. This is shown by the following facts:

1. In somite abbreviation rings innervated from the same ganglion fuse together.
2. In somite growth (multiplication of annuli) new rings appear chiefly at the limits of the somite (as defined), usually first at the posterior, then at the anterior end of the somite.
3. An abnormal animal, in which a somite is wanting in either half of the body, shows that the missing rings form a somite, limited as stated above.

The multi-annulate structure of the leech somite is correlated with the restricted number of somites in the body (thirty-four both in the Rhyncobdellidæ and in the Gnathobdellidæ). Increase in length of body and complexity of structure has been brought about not by multiplication of somites, as in the Chaetopoda, but by elongation of existing somites and multiplication of their annuli.

Whitman and Bristol have established the derivation of the five-ringed type of somite from the three-ringed type; several facts indicated the probable earlier derivation of both from a one-ringed type of somite. Among these may be mentioned

the manner of somite abbreviation and the structure of the somite in Branchiobdella and related forms.

*The development of the pigment and color pattern in Coleoptera:* W. L. TOWER.

The object of this research was to find out if possible: (I.) the way in which the colored patterns developed, and the sequence of the colors in ontogeny, (II.) the origin of the pigment and its development, (III.) something of its composition.

I. In Coleoptera two types of colorations are found.

(1) Unicolorous, where the whole animal is of one color.

(2) Multicolorous, where there is a color pattern of two or more colors.

I have studied the development of the color pattern in several forms of each type.

After the larva transforms to a pupa it is white or pale yellow. Color first appears on the cuticula of the future beetle about the opening of the spiracles, *i. e.*, where the spiracular muscles are attached to the cuticula. Color next appears upon the prothorax as two bands laterad of the median line, then a more or less broken band laterad of the first two appears, and last of all two spots at the anterior and posterior outer angles. The places where color first appears is over the attachment of the muscles to the cuticula. These spots may all become united as in the unicolorous, or remain separated as in multicolorous type forms. Color next appears upon the head, over the attachment of the cranial muscles to the cuticula, and then color appears upon the ventral abdominal surface over the muscular attachments.

The color as it first appears is pale yellowish brown which rapidly darkens, becomes very dark brown or black. This dark or black color is, according to Hagen, dermal pigment: There are some beetles that have a unicolorous type of color