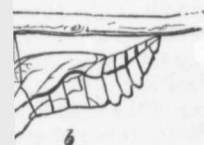


d. In some kinds

moths, in which



her hanging from a
a girdle, (Fig. 30b),
caterpillar enters on
d (Fig. 32), except
ace of the ground.
te the earth itself,
y by the movement

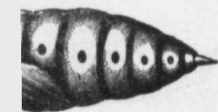


FIG. 32.

tongue, by means
hs have the mouth

parts aborted, and consequently take no nourishment as perfect insects, their life being correspondingly brief. This spiral tongue consists of the elongated soldered maxillæ; the mandibles or jaws of the larva becoming rudimentary in the perfect state. The sub-equal wings consist of a membrane traversed by a simple system of nerves or veins, the neurulation, covered with scales and fringed with hair. The thorax has a distinct portion in front, the collar (*collare*). The abdomen usually tapers posteriorly, in some females it appears blunt, being provided with heavy tufts, the hairs from which are used sometimes as a nesting for the eggs. As caterpillars, the Lepidoptera usually feed and grow, whereas as butterflies and moths they occupy their brief lives chiefly in propagating their kind, the sexes being separate and the females laying eggs, singly or in patches or clusters, from which again caterpillars emerge. To this latter there are a few exceptions. In the case of some Spinners and the Tineid genus *Solenobia*, a parthenogetic race has been observed, the virgin females laying eggs which produce only females, no males being hatched, the complete species is only produced by a union of the sexes. What are called "Hermaphrodites" are also sometimes found, in which, in one and the same individual, the two sexes are variably united, one side being more or less completely male, the other female. This is seen occasionally in the larger spinners, *Platysamia Cecropia* and *Callosamia Promethea*, when the division is clearly marked by the sexual differences in the antennæ and colour. Such specimens are abnormal productions and infertile, not true Hermaphrodites as the snails normally are. Bastards, resulting from the union of two species, occur, and have been noticed, especially in the hawk moths, but I have never seen an undoubted example of this kind myself. By confining the perfect insects, bastards have been artificially produced; in nature they seem to occur rarely. New species are probably never formed in this way of unnatural selection.

The three divisions of the lepidopterous body mark also a division of function. The head is provided with jointed appendages for the purpose of holding, biting and masticating the food, or sucking the same in the perfect state, and here the sense-organs, eyes, ocelli and antennæ are situated. The three-ringed thorax supports three pairs of slender legs and the wings—the organs of locomotion. The nine-ringed abdomen contains the digestive and reproductive parts; breathing or the aëration of the blood is accomplished by stigmata opening on the sides of the body, chiefly the abdomen. In the butterflies those forms are highest in rank in which the front pair of legs are useless for walking, being apparently taken out of the locomotive series, curiously shortened and elevated, and seem like an additional pair of palpi or head organs. The interesting details of the anatomy of the head by my kind friend, Mr. Edward Burgess, should be known by students.

For the essential characters separating the butterflies and moths, I refer more particularly to a paper of mine read before the American Association for the Advancement of Science in August, 1873, the gist of which I here reproduce with fuller statements. There is first to be noted the differences in the structure of the antennæ. These usually long, jointed, thread-like organs, situated on each side of the vertex, are quite uniform in shape throughout the butterflies, being more or less club-shaped or thickened at the tips. From this latter character the name *Rhopalocera* has been given to them by Dr. Boisduval. On the other hand, the moths have the antennæ of quite various shapes and length, usually showing some sexual difference in structure. The position of these organs in the two divisions exhibits a marked change. In the butterflies the antennæ are comparatively rigid and straight, and are directed upwards and forwards. In the moths the antennæ are flexible and held horizontally, being not unfrequently deflexed along the sides of the body in repose. The antennæ are apparently less used by the butterflies, which depend more on their sight during their diurnal activity. That they are the organs of smell and are probably also sensitive to vibrations of the air, has been suggested by experiments. The feathered antennæ of so many male moths seem to be sensitive to odours given out by the female. In this way the fact is accounted for, that male moths will come long distances to find unerringly specimens of the opposite sex. One needs only to expose a freshly-hatched female of our larger spinners, even in the heart of the city, to verify this statement. The moths, resting in the daytime, seem also to depend on their antennæ to warn