Determination of the Directing Element in the Jaws of Insects.
By M. Joannes Chatin.

In a previous series of researches, the results of which I have submitted to the judgment of the Academy *, I have studied the variations which the jaws can present, not only in their *ensemble*, but in the parts of which they consist, when studied in boring-insects. For the purposes of such investigations these represent the fundamental types; remaining always near to its initial state, the jaw permits of the accurate recognition of the smallest details as to the development, relations, &c. of its different parts.

Highly instructive for all that relates to the descriptive anatomy of the organ though the boring-insects ("insectes broyeurs") are, they become insufficient when it has to be considered from the point of view of philosophic anatomy.

Among other questions in this connexion there is one which has been generally left in the shade. The theory of Savigny has traced in its broad lines the series of transformations which the jaw undergoes in order to adapt itself to the varying mode of life of insects. But what is the *rôle* to be assigned to the different parts of the jaw in its numerous functional adaptations? Ought they to play an equal part, or should one of the parts be pre-eminent? should it reduce the others to the position of satellites or assert itself as the centre of the curious processes which so strangely metamorphose the organ?

After a minute analysis, the question cannot be elucidated except by varying within wide limits the types on which it is proposed to determine which is the directing element of the jaw.

It is easily settled when one passes from the Borers to the Hymenoptera. According to a too widely spread opinion, their jaw would always take on the character which it presents in the Apidæ, in which its appearance differs profoundly from that in the Borers. There is nothing so baseless as this generalization; in reality the form proper to the Borers reappears in several genera (*Vespa*, *Microgaster*, &c.). The base of the organ is formed by a submaxilla, above which rises the maxilla, figuring as the central limb of the jaw; on its upper part it displays three appendages, among which the palp is far the most developed, the two others (galea and intermaxilla) appearing to be still secondary.

In *Gonatopus*, *Xyphidrina*, and *Bracon* it is seen that the galea increases progressively, at the same time that the intermaxilla approaches it more and more closely.

In the genus *Perilampus* the formation of a mixed galeo-intermaxillary plate may be seen. This is definitely constituted in *Cephus* and *Megachile*, much elongated, absorbing, so to speak, the intermaxilla; the galea is transformed into a powerful blade, which becomes henceforth the principal part of the jaw.

Here, then, is an organ completely modified, in no way resembling what it was in the Borers, tending, on the contrary, to the form presented by the Suckers, such as the Lepidoptera &c.

I could pass at once to the examination of these latter, but it

* 'Comptes Rendus,' 1879–1887, and 'Concours pour le Grand Prix des Sciences physiques,' 1885.

appears to me preferable to unite them to the preceding insects by an intermediate group, that of the Phryganidæ. Without discussing their multiple affinities, without recording the retrogression which their buccal organs undergo, I believe it necessary to insist on the arrangements peculiar to their jaws.

The somatic part corresponds, not to the maxilla, which is confined to the base of the organ with the submaxilla, but to the galea completed by a slender intermaxilla—a fresh manifestation of the tendency sketched in *Cephus*, *Megachile*, &c. The galea appears as the directing section of the jaw, and this idea is still further accentuated in the following groups.

As far as the Lepidoptera are concerned, Savigny has shown that their proboscis is the result of the union of the two jaws; all opinions to the contrary have been shown to be untenable. But what is the mode of constitution of the jaws so transformed? What part does each portion of the maxillæ play in the construction of this singular apparatus?

Observation shows that all the acting part of the organ arises from the galea. Its base comprises the submaxillæ and the maxillæ; greatly reduced and thrown back upon the sides of this base, the palps take no part in the formation of the trunk properly so-called.

If one examines a maxillary stylet in the Hemiptera, one is struck by its likeness to the mandible of a butterfly. In the two cases the base corresponds to the same parts; the lamellar region (channelled, excavated, setiform, &c.) is essentially galear; it is easy to supply a demonstration of this, and certain Cicads especially lend themselves to it.

So for the Diptera, the types to be studied must be suitably chosen. If we begin with the group of the Muscidæ, as one usually does, we are immediately brought face to face with difficulties which will explain the divergences. They disappear when we consider another family.

The Eristalidæ should be mentioned as especially offering forms which link with the previous ones in establishing from another side the passage to the singular mandibles of the Diptera, considered as the most aberrant in this respect. I limit myself to a *résumé* of the arrangements presented by *Eristalis tenax*. On a base cleft in two places there is inserted a tiny palp and a long blade, the latter giving to the mandible its general configuration; it represents the galea, to which the intermaxilla is joined.

So, in the Tabanidæ, the Culicidæ, &c., one recognizes the preeminence of the galea, so secondary when one confines one's study to the Borers. The exclusive study of these latter conduces to the view that the maxilla is the fundamental portion, whereas nothing could be more inexact. Morphographical analysis shows, in fact, that the maxilla undergoes a true regression, whilst the mandible acquires a new functional importance. This finds expression in certain tendencies, proving progressively:—(1) elongation of the galea; (2) fusion of the intermaxilla with the galea; (3) reduction of the palp.

Thus a double organic balance shows itself: the maxillary region

decreases in proportion as the appendicular region develops; further, in the former the palp and the intermaxilla dwindle as the galea (the sole directing portion) enlarges.

These facts seem to be of such a character as to modify the classic conception of the mandible; further, they permit a rapid extension to other buccal organs. Such is the object of the researches on which I am at present engaged, and of which I hope to give the further results in a later communication.—*Comptes Rendus*, 1896, tom. cxxiii. pp. 608–610.

On the Hibernation of Clavelina lepadiformis, *Müller.*
By MM. A. Giard and M. Caullery.

Clavelina lepadiformis, Müller, formerly somewhat rare on the coasts of the Pas de Calais, is become very abundant on the Bernard rocks, near Boulogne, since the establishment of the new port. To any one who observes the pretty corms of this Synascidian it is a very interesting problem to know how it is that the colonies, sometimes as large as the fist, disappear entirely in the winter, to reappear in the month of June in the following year, with the same development and in precisely the same positions. One cannot attribute the formation of these new corms to the proliferation of the oozoïtes produced by the old ones, because, rapid though the budding of these oozoïtes may be, it could not suffice to produce such large masses in so short a time. But if, towards the end of September or in October, or even during the equinoctial tides of the spring of the following year, one examines carefully the place occupied by the vanished colonies, there will be found adhering to the rocks numerous ramified and interlacing stolons, bearing here and there little whitish glomeruli of a chalky appearance, the whole constituting an *ensemble* which recalls well enough the general aspect of a colony of Bryozoons of the genus *Bowerbankia*. It is the form under which the *Clavelina* hibernates, reduced to tubular stolons filled at certain points with reserve material.

Nature of the Stolons.—The stolons in which the reserve material is accumulated are identical with those which during the summer unite amongst themselves the different individuals of the cormus, and on which are formed the ordinary blastozoïtes. They arise from the lower part of the abdomen of the individuals. Often they climb to the surface of these, and not infrequently the tunic of the stolon is so united as to be continuous with that of the individual. As, on the other hand, the stolons divide themselves into sections, one often sees isolated fragments of them crammed with reserve material, forming part at certain points with the tunic of individuals of which the branchia and digestive tube have more or less completely disappeared.

Like the normal stolons, the hibernating stolons enclose a prolongation of the epicardiac tube ("cloison stoloniale"), of which the two faces are fused.

Modifications of the Stolons.—At certain points more or less regularly interspaced the stolonial tube produces numerous lateral digitiform diverticula, forming the whitish glomeruli in which the reserves are accumulated, and which may be compared with the *gemmules* of sponges and the *statoblasts* of the Bryozoa. On these

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