

in form, structure, and functions, from the stem and branches, and could not, homologically, be compared with them. The nerves of the leaves did not all diverge at the same angle, neither did the branches. These last were exposed to various influences during the life of a tree, and in consequence diverged from the stem at various angles in the different periods of growth. It was therefore a dream of the imagination to hope to determine a typical angle of divergence, when the plant was endowed with a considerable range of variation to fit it for its place in the œconomy of nature.

Prof. Goodsir had listened to Dr. M'Cosh's paper with much interest, on two accounts: first, because it appeared to him that its author had, in endeavouring to reach one of the objects he had in view, embodied another attempt to investigate the laws of organic form by that precise or geometrical method, which can alone ultimately elevate natural history to the platform of the perfect sciences; and secondly, because, although he could not admit all the conclusions at which its learned author had arrived, he yet believed the paper to involve a great truth. If he might be allowed to use the expression in reference to a plant, the specific physiognomy of a tree, as a mass, appeared to him to depend on the particular bulk, form, and grouping of its constituent masses. Now, if the form and grouping does not depend upon, it certainly involves, the mode of branching peculiar to the species. Dr. M'Cosh had restricted himself to the investigation of the law which regulated the latter; but he had, and would meet with, that apparently at present insuperable difficulty in all such researches, viz. the variation within certain limits of the form of parts, or of the whole of an organized body, according to the particular conditions under which that part or that individual has been developed. Prof. Goodsir suggested that Dr. M'Cosh might be more successful if he would limit his inquiry to the law of ramification of a single judiciously-selected species; and would endeavour to grow that species under such invariable conditions as might afford an approach at least to the typical form of the species. He also believed that before the law which regulates the arrangement of the primary and secondary ramifications of a leaf can be ascertained, attention must be directed to the law of form in the parenchyma itself.

MISCELLANEOUS.

On Parasitism. By M. LÉON DUFOUR.

PARASITISM seems to be a law of nature, so generally does it prevail throughout the living world. This existence imposed in the creation upon other existences is at once a law of antagonism, of repression, and of guarantee for the maintenance of the harmony of nature. The attentive study of the articulated animals, and particularly of insects, presents to us the prodigies of parasitism in profusion, whether the lens examines the integument of the animals, or the science of the scalpel steps in to sound the depths of their organism.

I have already had the honour to present to the Academy the

history of a frail gnat,—a *Cecidomyia*, which, by pricking the floral envelopes of the birch, causes an irritation productive of tissue, a vegetable hypertrophy, in one word a *gall*, the cradle of its young. But by the law of parasitism their domicile is invaded by two usurpers whose mission it is to repress the too great multiplication of the *Cecidomyia*.

One of these usurpers is a Hymenopterous insect of the genus *Misocampus*;—it divines, in this hermetically closed gall, the presence of the quiet larva of the *Cecidomyia*, and by means of an invisible oviduct introduces an egg into its entrails. From this egg is hatched a gnawing worm, destined to take its nourishment from the living tissues of its victim. The latter, although bearing in its bosom this germ of destruction, continues to devour the substance secreted by the walls of its gall, and the work of assimilation becomes more active in consequence of the consumption of the parasite. But when the time of the metamorphosis arrives, the larva of the *Cecidomyia* wants the materials necessary for the completion of this great operation, whilst the larva of the *Misocampus* redoubles its nutritive energy in order to insure its transformation, which is accomplished on the corpse of its victim.

The second usurper of the gall belongs also to the Hymenoptera,—it is an *Eulophus*; this time, however, it is no longer a single worm, but a flock of ten or a dozen famished larvæ, which consume the food of the *Cecidomyia* and consequently that of its parasite the *Misocampus*.

Let us now exhibit another kind of parasitism, that of larvæ finding their nourishment in the bodies of living perfect insects; and see how, confined in a prison destitute of communication with the external air, they are enabled to breathe.

By dissection in water these parasitic larvæ are usually detached; all that can then be proved by the lens, through the transparent skin, is the existence of ramified tracheæ, and consequently the circulation of air through all the tissues. The problem to be solved therefore was the mode in which this air was inhaled, with the condition of a hermetically sealed prison. Dry vivisection has at last revealed to me this mystery.

In 1827 I published the history and iconography of the metamorphoses of a fly, the *Ocyptera bicolor*, the larva of which lives in the abdomen of a Hemipterous insect, the *Pentatoma punctipennis*. It is not within the viscera that it passes its larva state; it is always found outside the intestinal canal, and is nourished at the expense of the adipose and other tissues of the *Pentatoma*. I satisfied myself, that by means of a long, somewhat membranous, caudal tube, terminated by a double hook, it had appropriated one of the stigmata of its host. By this organic usurpation, it attained the easy and complete exercise of respiratory action.

Ten years later, I made known the larva of a Dipterous insect, the species of which is still undetermined, which lived as a parasite in the abdominal cavity of the *Andrena aterrima*. This larva had not, like the preceding, seized upon one of the stigmata of its host, but,

such are the infinite resources of the Creator, it had grafted, by some mysterious operation, its own stigmata upon one of the two large trachean reservoirs, situated, in the *Andrena*, as in many other Hymenoptera, at the base of the abdomen. Thus, not only does the *Andrena* feed with the products of its own nutrition, this larva which an immutable decree has inflicted upon it, but it is compelled to respire for it,—to furnish it, in its own ample aëriferous reservoirs, with all the air necessary for its respiration.

Thus we pass, from wonder to wonder, to a recent example of parasitism, the circumstances of which seem fabulous.

In the summer of 1850, I had pinned in a box several living specimens of a weevil which lives on the tops of our pines,—the *Brachyderes lusitanicus*. The next day I found in the box some small chrysalids or pupæ, issuing without doubt from these weevils. I perceived without difficulty that these pupæ, which the unlearned would have taken for little red grains, were the cradles or swathes of a Dipterous insect belonging to the immense family of *Muscidæ*. After a few days I had the satisfaction, always new for my old experience, of witnessing the exclusion of a pretty little new fly, the colouring of which differed in the two sexes. I hastened to publish this double fact, and the fly was christened *Hyalomyia dispar*. But this was only two-thirds of the history of the metamorphoses of this fly;—the initial phase, that of the larva, was wanting. The discovery of this I put off to the next year, and I have been able to realise my wishes. I am not going to describe this larva of an eighth of an inch in length; I shall confine myself to exhibiting, in connexion with parasitism, one of the most interesting facts of organic usurpation. This larva, like that of the *Ocyptera* previously mentioned, lives outside the digestive viscera, in a cavity without air and without issue. In the vivisection of one of the weevils, I had the rare good fortune to find two larvæ of the *Hyalomyia*. One which was detached and free had two posterior, tubular stigmata, opening to the two lateral tracheæ; this was sufficient to convince me that it had a complete respiratory apparatus. The other remained fixed, and I was able to prove, without the slightest doubt remaining on my mind, that one of the stigmata of the weevil had been usurped. There was not here, as in the *Ocyptera*, a supple caudal tube; the larva was sessile, and its adhesion appeared to be the result of a graft by approach,—a sort of *organo-plastia*. The two microscopic tubular stigmata of the larva corresponded exactly to the respiratory aperture of its host, and thus drew in the atmospheric air directly.

Figure the agitation, the patience, the active manœuvres of the *Hyalomyia*, when, urged on by a mature gestation, she flies to the tops of the pines to place her eggs in the stigmata of the *Brachyderes*! Judge of the difficulty of this egg-laying on the wing from the shielded structure of the beetle! Although of a tolerably large size, it is apterous; its elytra, soldered together and hard, are closely united by an imperceptible suture to the equally hard walls of the ventral segments. What sharpness of vision, what urgency of maternal inspiration, must drive the fly to seek the one defect in the armour, to profit by the fugitive moment when the stigma of the beetle is in

exercise, to place an egg in it with the quickness of thought! But think you that this egg is merely laid in the usurped stigma? It must be fixed there, glued by a gummy liquor; and I have proved that a *sebific gland* exists for this purpose in the oviduct of the Diptera. Without this precaution the egg would be exposed to displacement during the constant action of the respiration of the beetle.

But this is not all that takes place. When the parasitic larva has completed its growth, it is called upon to undergo its metamorphosis to a pupa. No delay is allowed it; it detaches itself from the borrowed stigma,—its skin breaks its organic adhesions; its whiteness and transparency pass to a bright, opaque orange. It is nothing but a shell, the covering of a nymph, the swathed and mysterious image of the future fly.

I have said above that the living prison of the larva was without air and without issue; how then is the exit of these pupæ effected? Alas! this unnatural delivery costs the weevil its life. After its detachment, the larva, no doubt obeying an instinctive mission, tears the upper membranous coat of the apex of the beetle's abdomen. It fixes itself in this breach and there completes its transformation into a pupa. The maturity of this causes slight movements in the inclosed nymph, at the same time that by its titillation it provokes the expulsive efforts of the weevil. At last the pupa comes to light; it soon splits and opens at its thoracic region, and the active *Hyalomyia* darts into the air.—*Comptes Rendus*, 11 Août, 1851.

RARE IRISH MOLLUSCA.

To the Editors of the Annals of Natural History.

Shantalla, September 18th, 1851.

GENTLEMEN,—The following rare Mollusca were recently obtained by dredging round the South Isles of Aran, Galway Bay:—

Næra cuspidata; in 60 fathoms, about twelve miles to the westward of the Great S. Isle.

Tellina balaustina; two specimens alive with numerous single valves, in 20 fathoms, South Sound of Aran, opposite the southern point of the Middle Isle.

Anomia striata; depth uncertain, South Sound.

Nassa pygmæa; range 10 to 60 fathoms.

Buccinum Humphreysianum; a single young specimen alive, in 60 fathoms, along with *Næra cuspidata*, *Natica sordida*, &c.

I am, Gentlemen, your obedient servant,

ALEXANDER G. MELVILLE.

On the Umbrella Bird (*Cephalopterus ornatus*), “*Ueramimbé*,” L. G.

By ALFRED R. WALLACE.

Having had the opportunity of observing this singular bird in its native country, a few remarks on its characters and habits may not perhaps be uninteresting, at a time when a consignment from me will have arrived in England.



Dufour, Léon. 1851. "On Parasitism." *The Annals and magazine of natural history; zoology, botany, and geology* 8, 425–428.

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