of these families to be the same as those of the genera. The arrangement of the cells constituting the corpus adiposum, the relative size of the males, and the position of the vulva, will probably, however, be found somewhat variable, and are perhaps characters of not more than generic importance; in which case the arrangement of the nervous system, the presence or absence of an œsophagus, the presence of a single or double ovary, and the development of the young, will, with the absence of the anus, remain as the principal family characters.

I shall endeavour to get some humble bees in the course of this winter, in order if possible to determine some of the many points which yet remain to be ascertained; and I should feel very grateful to any one who would send me even a single specimen of any species of Bombus between the months of December and April. In the meantime, Sphærularia still remains, as it was when Diesing wrote the "Systema Helminthum," a "genus inquirendum."

DESCRIPTION OF PLATE I.

1. *Sphærularia bombi* × 15. A. Small male.
2. Part of corpus adiposum × 10.
3. Free end of ovary × 250.
4. Two young eggs with rachis × 250.
5. Portion of ovary × 250.
6. Outline of young × 60.
7. Outline of male (?) × 60.
8. Head of male × 60.
9. Tail of do. do.
10. Ovary ×
11. Egg, showing the commencement of segmentation, × 250.
12. Do., in a more advanced stage, × 60.
13. Young egg, still more advanced, × 250.
14. Place of union of male and female × 250. *a*. Part of the body of male. *b*. Part of skin of female. *c*. Projection of male fitting into sac-like depression of female.

VII.—On an Organ in the Skate which appears to be the homologue of the Electrical Organ of the Torpedo. By Robert M'Donnell, M. D., F. R. C. S. I., Lecturer in the Carmichael School of Medicine, Dublin.

In the eyes of those who look without prejudice on the theory of descent with modification, the tracing out of homologies has, in recent times, been invested with a new interest. On this theory, the comparative anatomist no longer, in following out the homological relations of parts and organs, pursues an object, captivating, but fruitless, as fascinating as the solving of a puzzle, but barren as to general results.

On the other hand, the candid inquirer must admit, that when in some creatures well-developed special organs exist, while in their immediate kinsfolk (if I may use the term) no trace of kindred structures has been discovered, there herein exists a grave objection to any theory of unity of type resulting from community of descent. This difficulty appears to have been more obvious to Mr. Darwin than to most of the reviewers who have undertaken to criticize his views, or at least has been more clearly and fairly stated by the former than by the latter; and he speaks of the case of the electrical organs of fishes as one of special difficulty.

The presence of modified, atrophied, or rudimentary organs, constitutes one of the strongest arguments in favour of Mr. Darwin's theory; for the supposition is as unsatisfactory as it is improbable, that such organs are the result of what would seem a whimsical exercise of creative power in framing an organ merely for the sake of symmetry. The total absence, however, of any trace of even an altered or rudimentary organ representing a structure known to exist in certain members of a group, would afford good testimony against the theory of descent; as it would be at least in the highest degree improbable that such a structure should not have its homological representative existing in some form in the immediate members of the same family.

Considering, therefore, that on the theory of Mr. Darwin it was in the highest degree improbable that the electric organs of the Torpedo were totally absent in the Skates, I undertook a careful search, with the view of following out their homologies, determining to do so by tracing the nerves corresponding with those which go to supply the batteries of the Torpedo. I have thus been led to make out the bodies which I conceive to be the true homologues of the Torpedo's wondrous organs; and the anatomical position and peculiarities of which I shall briefly point out. If the skin be removed from the fore part of the back of a common Skate, the following parts will be readily found, a short distance behind the temporal orifice:—1st. That band of the so-called muciferous tubes which runs inwards and a little backwards from a point external and anterior to the gills; 2nd. The dorsal aspect of the branchial chambers; and, 3rd. The little snout-muscle, which ends in a long delicate tendon, running forwards. Let the little fleshy belly of the snout-muscle be raised and drawn outwards, and the band of tubes dissected up and drawn forwards, in the angle between them will be found the body sought for; it will not, however, be very apparent to the naked eye; but if brushed over with some tolerably strong acetic acid, it will become quite distinctly visible. It will be found to be more than an inch long in an ordinary sized fish, wedged in between the occipital muscles internally and the gills externally, covered superficially by the snout-muscle and tubes already mentioned, and dipping down so as to reach the branches of the vagus going to the branchial arches. Its upper surface is triangular, the apex behind the base in front, in contact with one of the large jaw muscles. When made evident by the aid of acetic acid, this little body is seen to consist of a

number of quadrangular and pentangular masses, of minute size and rather irregular form, packed closely together like a mosaic work, arranged vertically, and somewhat resembling a small conglobate gland in appearance. Examined microscopically, it is found to consist for the most part of an abundant, soft, yellowish substance, composed of minute round granules, nearly all equal in point of size, and apparently devoid of nuclei. This granular matter is entangled in an abundant areolar texture, in which, when washed several times, there are to be discovered peculiar nucleated bodies, large, and varying considerably in dimensions, which are at first obscured by the granular matter, and seem to be more or less intimately connected with the small nervous ramifications. Neither when viewed by the naked eye, nor by the aid of the microscope, does this organ in the least resemble the tail electric organ discovered by Stark. Unless the peculiar nucleated bodies already mentioned (and which form indeed a very small part of the mass) be regarded as a modified condition of it, nothing like the "tissue electrique" of Robin exists in the body I have described, while the tail-organ is almost entirely made up of this tissue (Kölliker's Schwamm-Körper).

The nerves supplying the little body which I have described are, first, minute filaments derived from the branches of the vagus going to the gills; and, secondly, a larger one, derived from the posterior branch of the fifth pair, which takes the following course:—If the large branch of the fifth, which is found under the skin immediately behind the temporal orifice, be followed backwards, it will be seen, that after escaping from the cranial cartilage, it gives a branch backwards, which enters the muscle behind it, and, supplying this muscle with several twigs, passes through it to reach the body in question, which it supplies, also giving a little twig to the snout-muscle which covers it.

On carefully inspecting this large division of the fifth pair, the difference of colour is quite obvious between that portion which is destined to go to the ampulla, from which the so-called muciferous tubes take rise, and that portion destined for the muscles; nor is it uninteresting to observe, that the branch going to the supposed homologue of the electric organ is derived from the latter. I need not say that it would be quite impossible to trace so minute a nerve so as to find out whether, at its origin, it may be related to the anterior or posterior columns of the cord; but the fact mentioned tends to support the view that it is related to the motor tract.

As the lateral line system exists in the torpedo and other electric fish, in a rather remarkable condition of development, the opinion held by some authors may be set aside, that it in other fishes represents the electric organs; the same may be said for the so-called muciferous system of rays and sharks (which Geoffroy St. Hilaire conceived to represent the torpedo's batteries), inasmuch as this system also co-exists in the torpedo with the electric organs.

That the tail-organs already spoken of, as discovered by Stark, and since so well anatomised by Goodsir, Robin, Leydig, Ecker, Remak,

and Kölliker, and more recently by Max Schultze, are not the true homologues of the electric organs of the torpedo, their position, their structure, and nervous supply, lead me to suppose. Indeed, in so far as this last is concerned, it indicates rather an homological relation with the batteries of the gymnotus, which further research may more fully establish. In alluding to the tail-organs of the skate, I may observe, that in the dog-fish I have found, both in the embryo and the adult, what I conceive to be those organs, in an atrophied condition. They give rise to slight eminences, prolonged from near the vent to the tail; and, on transverse section, are seen like narrow chinks in the corion, quite separated from the muscles.

It may occur to some, as it did at first to myself, that the organ which I have described in the skate may represent the "appareil folliculaire nerveux," noticed by Savi, and by him stated to exist only in the electric rays. I think, however, that this apparatus is clearly an appendage of the so-called muciferous tube system; and, agreeing with the views of Leydig, that these appurtenances of the fifth pair are tactile organs, it does not appear that there is any sufficient reason to consider that any homological relation exists between the "appareil folliculaire nerveux" and the bodies in question. In the electric rays which I have examined, I have not found the body which I regard as the homologue of the electric organ; this fact, indeed, taken along with the consideration of the sources from which the nerves of the organ are derived, are the chief points on which the notion rests, that it may be the homologue of the electric organ at all; but one also cannot help observing in its position, with reference to the band of muciferous tubes, the lateral line, the temporal orifice, and the posterior branch of the fifth pair, evidence in support of the same idea. In stating, however, that the organ is absent in the electric rays (or, at least, only represented by their batteries), I should say that I cannot positively assert this; for the torpedos which have come into my hands have all been partially dissected, and it is possible that the body alluded to may have been removed. I may beg of naturalists who have opportunities of doing so to determine this point with certainty.

VIII.—Notes on the Anatomy of the Alimentary System of the Axolotl (Siredon Mexicanum). By E. Perceval Wright, A. M. Dub. and Oxon., M. B., F. L. S., Lecturer on Zoology, University of Dublin (with Plate II.).

The earlier investigators of the anatomy of the axolotl appear to have regarded it as a larval form. This, some of them, as Rusconi, did, judging merely from its external appearance; others, as Cuvier, even after a somewhat minute investigation into its anatomy.

Hunter, it is true, was convinced that they were adult forms, and merited but little the censures passed upon him by Rusconi, who, from constantly studying the salamanders and their metamorphosis, dogmati-