

part. There are generally two or three such nerves, which apparently have nothing to do with the large nerve supplying the central disc.

Ussow's representation of the innervation of the organs in *Stomias anguilliformis*, where a single nerve is said to enter at the back of the spherical part, does not coincide with Leydig's observations or my own.

The innervation of these organs corresponds to that of the simple phosphorescent organs above described, and in every case the nerves supplying them are branches of *spinal* nerves.

#### d. Function.

It is not very difficult to perceive the functions of the different parts of these organs. The pigment coat prevents the light from issuing in any other direction than that indicated by the axis of the organ.

The membrane which reflects the light produced within the organ is, in consequence of its shape, very well adapted for the purpose of concentrating the light in one cone.

The optical action of this reflecting membrane is illustrated in Pl. LXIX. fig. 4. The spherical part reflects all the rays of light which are thrown in a centripetal direction, until they pass from it into the cup-shaped portion. As the cup has the shape of a rotation-paraboloid, all the light which issues from the focus of the parabola will be reflected parallel to the axis of the optical system, whilst light coming from other points in the neighbourhood of the focus will be reflected in a more or less similar direction, so that *all* the light produced within the organ issues from it in the shape of a cone, the axis of which is the continuation of the axis of the optical system. The light passing through the concavo-convex lens is further concentrated and may be emitted from the fish as an intense flash in the direction of the axis.

There are muscles surrounding these phosphorescent organs, but it is doubtful whether the organs are movable. If they were, the fish could of course throw flashes of light from them in any desired direction, and by setting the axes of all the organs of one side in the same direction, might produce a "broadside" of light-flashes sufficient to illuminate objects at some distance.

There can hardly be any doubt that the spherical part of the organ is filled with a glandular structure. The cells of the layer found just within the membrana propria are probably ganglion cells in connection with the nerves which supply this part of the organ. The gland-tubes are morphologically very similar to those in the simple organs, and produce a granular secretion by the same process of direct conversion of cell-substance into secretion. The secretion accumulates in the space below the disc, and the disc itself is evidently composed of ganglion cells, which are in connection with the large nerve, to be designated after its discoverer, Leydig's nerve.