On the Lateral Eyes of Spiders.[1]

by

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In order to compare *Limulus* and spiders with respect to the development of their eyes, I re-examined my sections and found that I had overlooked in my recent paper, a very important stage in the development of the lateral eyes of spiders,* so that my views on this point were in part incorrect. This obliges me to write out briefly the new conclusion I have arrived at.

All the lateral eyes of spiders, generally three pairs, arise from a *common* thickening of the epiblast on each side at the posterior external corner of the lateral vesicle before it is completely cut off from the general epiblast—at about the stage of the reversion of the embryo. The thickening is slightly *invaginated* and consists of cells arranged in many irregular rows (fig. A).

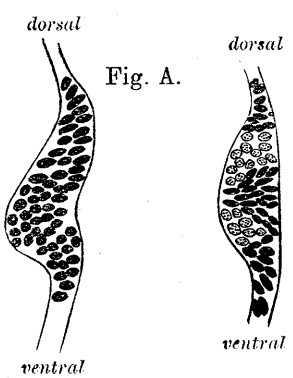

Fig. A. Fig. B.

Longitudinal sections through the "optic area" of the lateral eyes. Fig. B shows the "anterior lateral eye" and "posterior lateral eye" only. Zeiss 2 × D.

After the process of the reversion of the embryo has greatly advanced, the invagination disap-

1. This article was published in the Zoologischer Anzeiger No. 376 of Nov. 2 1891.

* *On the Development of Araneina.* This Journal. Vol. IV.

pears, and the epiblastic thickening above the lateral vesicle, which latter is by this time separated from the general epiblast becomes flat.

When the reversion of the embryo is almost over, a differentiation occurs among the nuclei of the epiblastic thickening. At three places in the thickening, nuclei become a little larger, and stain slightly less than those which are found elsewhere, and which are pressed together and are of a long ellipsoidal shape (fig. B).

These three groups of larger nuclei form the retinal portion of the three lateral eyes. They are spindle-shaped or rather wedge-shaped, narrower towards the exterior surface. Later they are separated from the surrounding nuclei at the narrower end by a ring-like furrow, peculiar to the lateral eyes, and the surrounding nuclei grow and meet together over the retinal portion, forming a layer of cells—the vitreous body.

The lateral eyes receive their nerves from a portion of the brain, formed by the lateral vesicle. Thus the latter is the optic ganglion, formed from an invagination, independently of the semicircular cephalic groove which gives rise to the brain proper.

The common epiblastic thickening of the lateral eyes of spiders is most probably homologous with the epiblastic thickening of the lateral compound eyes of *Limulus*, as its position is just the same and the invagination is similarly produced in both cases. Then, are the peculiar groups of larger nuclei of spiders homologous with the ommatidia of *Limulus?* I am inclined to believe that such is the case and that *the lateral eyes of spiders are separated, enlarged, and modified ommatidia of a compound eye of their ancestor.*

In Pl. IV, illustrating Parker's paper "The Eyes in Scorpions," we distinctly see that all the lateral eyes of the scorpion also arise from a common thickening of the epiblast. Thus we see that the occurrence of this interesting phenomenon is not confined to spiders but is found in

an allied order, Scorpionidea. Parker, however does not seem to consider this interesting fact as of much value, if he has not indeed overlooked it.

Lankester and Bourne* arrived at the same conclusion as I have done, from a study of the structure of the eyes of the adult *Limulus* and of *Scorpio;* but they wanted the embryological proof. Since they wrote much work has been done on the development of spiders, scorpions and *Limulus;* but no one till now has confirmed their conclusion.

The facts that the number and the relative position of the simple eyes of spiders and scorpions are very variable and that the eyes are placed more closely together in the embryonic than in later stages, speak in favour of our conclusion.

The separation and modification of the ommatidia of a compound eye into simple eyes are probably the effects of the change of the animal's habit—from that of wandering about in pursuit of prey to that of lying in wait for it.

The lateral eyes of spiders were called "Augen mit präbacillären Kern" by Graber, and "Nebenaugen" by Bertkau; but as they are homologous as a whole with the lateral eyes of scorpions and with the lateral compound eyes of *Limulus*, I propose to call them *lateral eyes* as I have done in this paper.

* Lankester and Bourne—*The Minute Structure of the Lateral and the Central Eyes of Scorpio and of Limulus.* Quart. Jour. Mic. Sc. XXIII.