to the Mediterranean and Madeira. A small number occur in the Arctic seas.

It may be convenient to identify as far as possible a number of Heller's species which are probably referable to forms already described when he wrote, and to note some of the changes in the generic names :—

Scrupocellaria capreolus, H., = *S. Bertholletii*, Aud. ; *Diachoris simplex*, H., = *Membranipora patellaria*, Moll (sp.) ; *Membranipora bifoveolata*, H., = *Micropora impressa*, Moll (sp.); *Lepralia cribrosa*, H., = *Crib. punctata*, var.; *Lepralia Kirchenpaueri*, H., ? = *L. adpressa*, Busk ; *L. appendiculata*, H., ? = *C. marsupiata*, Busk ; *L. Steindachneri*, H., = *Cribrilina Gattyæ*, Busk ; *Eschara fascialis* = *Lepralia foliacea*, form *fascialis* ; *Eschara cervicornis*, M.-Edwards, = *Smittia cervicornis*; *Discosparsa patina*, H., = *Lichenopora radiata*, Aud. ; *Obelia tubulifera*, Lamx., = *Idmonea serpens* (young) ; *Valkeria verticillata*, H., = *Hippuraria verticillata*.

EXPLANATION OF PLATE IX.

Fig. 1. *Flustra tenella*, n. sp. 1 *a*. Avicularium.
Fig. 2. *Flustra securifrons*, Pallas. Zoœcia magnified, to show the rib-like appendages protecting the opening of the oœcium. 2 *a*. Avicularium.
Figs. 3, 3 *a*, 3 *b*. *Smittia trispinosa*, Johnston, form *spathulata*, Smitt. 3 *c*. Spatulate avicularium.
Fig. 4. *Lepralia complanata*, Norman.
Fig. 5. *Cellepora retusa*, Manzoni, var. *caminata*, Waters.
Fig. 6. *Bowerbankia biserialis*, n. sp. An internode and its zoœcia, magnified. 6 *a*. Portion of stem, showing a joint and the mode of branching.
Fig. 7. *Buskia socialis*, n. sp. One of the groups of zoœcia, magnified. 7 *a*. A single zoœcium. 7 *b*. Nat. size.
Fig. 8. *Hippuraria verticillata*, Heller (sp.). Zoœcia. 8 *a*. A portion of the stolon, with one of the nodular enlargements from which the groups of zoœcia originate.
Fig. 9. *Flustra pusilla*, n. sp. Group of zoœcia, with avicularia.
Fig 10. *Flustra membranaceo-truncata*, Smitt. Zoœcium with avicularium.

XL.—*On the Structure of the Pseudoscorpions.*

By A. Croneberg *.

The circumstance that a small Pseudoscorpion, *Chernes Hahnii*, C. Koch, occurs pretty plentifully near Moscow

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under the bark of trees, led me to undertake as thorough an anatomical investigation as I was able to make of this representative of a group of animals which is still but imperfectly known. Besides the above-mentioned species I had at my disposal a few specimens of a rarer undetermined species of *Chernes*, as also of *Chelifer granulatus*, C. Koch.

The buccal aperture is on the lower surface of a rostrum which unites the basal joints of the maxillæ from above, and of which the anterior part consists of a nearly transparent chitinous membrane, which projects in the form of an elongate ovate upper lip. The margins of this lamella, which are folded downwards, are soldered together anteriorly in the middle line; but further back they separate from each other and are furnished here with a fine denticulation. In the space between them a second strongly boat-shaped compressed lamella is received like a lower jaw, and its margins are also finely denticulated. The whole in profile has a certain resemblance to a shark's tail. Posteriorly the two lamellæ pass over into the wall of the short pharynx, which is situated immediately beneath the basal part of the rostrum. The strongly chitinized wall of the pharynx is produced into four ridges, so that the narrow lumen has a four-rayed transverse section. Numerous muscles which extend partly between the ridges of the pharynx and partly between the latter and the walls of the body serve as dilators, while the contraction of this sucking-apparatus appears to be left to the elasticity of its walls.

Its posterior extremity abuts directly upon the central mass of the nervous system, which in nearly all the conditions of both external and internal structure resembles that of certain Acarida (*Eylaïs*, *Trombidium*)—a spherical brain seated upon a broad, quadrangular, thoracic ganglion; but I could not observe anything of the fine accessory nerves of the extremities which occur in many Arachnida. On the other hand, in *Chernes*, which, as is well known, is blind, there are a pair of fine nerves at the same part of the brain from which the visual nerves originate in the above-mentioned Acarida. The thickness of the nerve-cell layer around the inner granulo-fibrous substance in the whole of the cephalothoracic ganglion is also remarkable. The cephalothoracic ganglion is traversed by a very narrow œsophagus, which enlarges in the form of a funnel immediately behind the brain, and then at once narrows again to form the intestinal tube. This small dilatation forms the true stomach of the animal; like the intestine, it is lined with a clear small-celled epithelium, and communicates directly with three great hepatic sacs, two

lateral and one inferior, unpaired, which form the great mass of the viscera. The two lateral sacs again divide on the outside each into eight secondary lobes, between which the vertical abdominal muscles traverse the body-cavity, while the straight median margins meet in a shallow longitudinal furrow, in which the heart lies imbedded. The divisions of the liver are held together by a cellulo-vesicular connective tissue, which is particularly developed on their distal segments, but also occurs around the other viscera.

The unpaired inferior hepatic sac only has slightly undulated contours and extends into the last third of the abdomen, beneath the genitalia, by the efferent ducts of which it is embraced anteriorly. The inner lining consists of large cells densely packed with granules and oil-drops; among their brown contents small accumulations of a chalky-white substance show themselves very distinctly, giving the whole organ the appearance of being closely sprinkled with white; larger portions of the same substance also form the exclusive contents of the intestine. It is interesting to see how this white excretion, which in the Hydrachnida and Trombidida forms exclusively the residue of the digestive process, does not appear in the Pseudoscorpions enclosed in a canal-system with proper walls separated from the liver, while in the Hydrachnida such a system occurs in all transitions from a widely branched excretory tube (*Eylaïs*) to a massive unpaired one (*Hydrachna*) which is applied to the wall of the stomach, and, as I have shown, opens into the anus, in continuity with which it can be separated from the cæcally closed stomach. In Pseudoscorpions, as Menge correctly states, the intestine forms a double loop, and opens by a dilated rectum into the anus.

Like Daday, I find the heart extending from the fourth ventral segment up to the brain; the posterior half possesses a musculature arranged in numerous transverse segments, while the lighter anterior portion, representing an aorta, divides into two branches just behind the brain. In *Chernes* the fissures (four pairs) occur only in the posterior, slightly dilated end of the heart, on which on each side a muscular fibre breaking up into several branches is inserted.

In both sexes the genitalia open at the base of the abdomen between two transverse chitinous plates, representing the second and third abdominal segments, not, however, with two apertures, as Menge thought, but with a single unpaired orifice. The testes in *Chernes*, as also in *Obisium*, have a form resembling that of the ovaria of the scorpion or the genitalia of *Eylaïs*, inasmuch as they consist of three longi-

tudinal canals (a median and two lateral ones), which are united to each other by transverse canals ; the meshes of the testes, as in *Eylaïs*, embrace the diverticula of the liver. In *Chelifer*, however, the testis, as quite correctly described by Menge, has the form of a simple median tube. From this, as also in *Chernes*, originate two anterior divergent *vasa deferentia*, which embrace the median hepatic sac and pass over into a complicated unpaired terminal segment. This forms first a strongly muscular spherical bulb, passing over into an S-shaped chitinous tube, which is united by special muscles with a framework attached to the external genital plate, and can be pushed forth as a copulatory organ. The contents of the testes consist of numerous balls of seminal cells in different stages of development, besides isolated packets of filiform zoospermia arranged in whorls.

The ovary of *Chernes* has the form of a long unpaired tube beset on both sides with a number of egg-follicles ; the mature ova each occupy the end of a follicle, while the peduncle is occupied by a number of small cells, and only in *Obisium* have I previously observed an epithelium surrounding the ovum on all sides. The follicles appear to persist for some time after the evacuation of the ovum ; at least I sometimes found them empty, and the young ova on the cellular peduncle sprouting forth at the base. The oviducts open into a short vagina, which is surrounded by a dense accumulation of unicellular glands, and further receives two much-contorted tubular glands. These accessory glands are represented in the male by two packets of unicellular glands, the fine parallel efferent ducts of which are directed towards the genital aperture, and further on each side by two sacciform appendages lined with a flat epithelium, which are connected with the *ductus ejaculatorius* and contain a granular substance. In this way all the glandular formations situated in this part of the body would be enumerated, although, according to previous notions, the spinning-glands have their locality here. However, at any rate in *Chernes*, I could not see the smallest trace of the spinning-tubercles, stated by Menge to occur here ; there were only ordinary chitinous hairs, which certainly had the arrangement described by Menge but had no connexion at all with any gland. As I repeatedly found the animals under bark during the cold season in their little watchglass-like webs, and further the spinning was actually observed by Menge, the organs implicated in it must be sought in some other part of the body, and it cannot be denied that the situation at the base of the abdomen would be anything but favourable to their function. In fact, I succeeded in disco-

vering in *Chernes* an apparatus which much better fulfils the requirements of a spinning-organ. Thus in the cephalothorax, above the brain and the anterior hepatic lobes, there are two considerable glandular masses which touch each other in the median line, and with their much attenuated anterior ends enter the basal joint of the cheliceræ. The glands themselves consist, on each side, of four or five cylindrical closely approximated tubes which contain granular cells grouped around a clear central canal; the cheliceræ receive only the narrow, chitinized efferent ducts, forming a fine bundle, which may be traced through the basal joint into the movable finger of the chela, traverses this, and enters into a soft-skinned process at its apex, which is characteristic of the genera *Chernes*, *Chelifer*, and *Cheiridium*. This process in *Chernes* terminates in four short conical points into which the ducts may be traced singly, and in which they probably open by a fine aperture, which, however, I have not been able to see distinctly. I found the same arrangement also in *Chelifer*. The structure of the chelicera itself also seems to support my interpretation, seeing that a number of processes exist upon it, and seem perfectly fitted for pulling and arranging the threads. Along the inferior surface of the movable finger there is a long comb consisting, in *C. Hahnii*, of eighteen plates; whilst on the immovable arm of the chela there is inserted a serrated and denticulated process, at the base of which rises a semicircular fold of skin.

MISCELLANEOUS.

On the Structure of the Muscular Fibres of some Annelids.

By M. Jourdan.

The author has made a special study of the muscles of the integuments of the following Annelids:—*Hermione hystrix*, Kbg.: *Polynoë Grubiana*, Clap.; *Eunice torquata*, Gr.; *Syllis spongicola*, Gr.; *Phyllodoce Paneti*, Bl.; *Siphonostoma diplochætos*, Otto; *Terebella Meckelii*, D. C.; *Sabellaria alveolata*, Lam.; and *Protula intestinum*, Lam.

The form of the muscular fibres varies between rather wide limits, but they may be referred to two types—some are nearly cylindrical, others distinctly lamellar. But there is an intermediate series of more or less ribbon-like elements. The muscular fibres are sometimes fusiform and short, when they are visible throughout their whole extent in the field of the microscope; in other cases they