

power, and then rely upon the acceptance of the terms with the restricted meanings.

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SCIENTIFIC LITERATURE.

Text-book of Comparative Anatomy. By ARNOLD LANG. Translated by H. M. and M. BERNARD. Part II. London and New York, Macmillan & Co. 1896. 8°. Pp. xvi+618, with many illustrations.

The second part of this well-known text-book has been impatiently awaited by teachers of invertebrate anatomy and those who desired a convenient work of reference summarizing the essential facts of the science. Among the numerous text-books of this sort which have appeared of late years, each of which has had its especial merits, that of Lang has reached an easy preëminence, on account of the wide erudition and judicial temper with which the different topics are treated. It is, of necessity, in one sense, a compilation and the chief criticism which has been made upon the German edition is that the authorities for the facts used are cited in mass as literature and not in connection with the particular data due to each. Prof. Lang explains that considerations of space made this obligatory, though, naturally, the work, as a book of reference, would have gained in value as well as size by specific citations. The translation, on the whole, is easy and idiomatic, only occasional Teutonicisms are noted, though it would seem as if some more apposite term than 'Appendage' might have been used for the supplementary chapters on *Rhodope* and *Rhabdopleura*. The typography of the English edition is much more tasteful than that of the original; the illustrations are well printed, and the work will doubtless receive a wide and merited acceptance as a text-book. The present volume includes *Mollusca*, *Echinodermata* and *Enteropneusta*, but the special criticism on this occasion will be confined to the mollusks.

It would be superfluous, perhaps, to criticise in this place the general plan upon which such text-books are constructed, but it cannot be denied that the comparison, organ by organ of a multitude of animals, leaves a somewhat incoherent impression upon the mind. As things

are constituted, anatomists are rarely systematists and the systematic part of any of the manuals leaves much to be desired by the specialist. The ideal comparative anatomy would relegate the specific facts to eminent specialists and the comparisons to a systematic genius as editor, a state of beatitude which we are far from approaching.

Prof. Lang is not an eminent specialist in mollusks, but he has a wide knowledge of the literature, and his remarks on mooted points are generally characterized by good sense and sound judgment. The compendium may be said to be, as a whole, representative of the date of 1889, though, in some instances, the text shows later references.

In selecting an architypal mollusk with which to compare his actual animals, the author has followed Lankester's hypothesis of 1884. The architype is regarded as an animal somewhat between *Fissurella* and *Chiton*, bilaterally symmetrical with a posterior vent and straight alimentary canal. We are of opinion that Prof. Verrill's suggestion that the architypal mollusk in the main conformed to the type of the molluscan veliger, with a bent intestine and anterior vent, is much more in harmony with our knowledge of the facts; but space forbids a discussion of the question here. The classification of the Pelecypods is adopted from Pelseneer, whose method has been of late pretty thoroughly tested and found wanting, though at the time this text-book was in the making, it was the newest and presumably the most satisfactory. On the whole, however, Prof. Lang has succeeded in bringing together the data in an excellent manner, and the cordial reception of the German edition is sufficient evidence of the estimation in which his work is held by his scientific colleagues.

Since this work will undoubtedly take a prominent place among the text-books used by teachers, it will not be regarded as hypercriticism to use the remainder of our space in pointing out such items as, on a general perusal, have appeared contestable, erroneous or obsolete. Any work of this kind necessarily contains a certain percentage of such slips, and their presence cannot justly be regarded as condemning it above its fellows. Their correction, therefore,

is not to be taken as diminishing the high opinion of the merits of Prof. Lang's work which we have already expressed.

The bloodvascular system of mollusks (p. 1) is not 'open' in the ordinary sense of that word, but closed, though partly lacunary.

In the true *Diotocardia* an intromittent male organ is absent chiefly in the littoral species, having been shown to exist in many deep water forms such as *Cocculina*, *Addisonia*, *Fissurella*, *Solariella*, many *Puncturellidæ*, etc., and it should not, therefore (p. 4), be predicated of the entire group. The arrangement of the *Tænioglossa* is imperfect (p. 6); the *Capulidæ* have a retractile proboscis and are therefore not 'Rostrifera.' The *Columbellidæ* are not *Tænioglossa*. *Janthina* can hardly be called siphoniferous.

The nudibranchiata are not all destitute of a mantlefold (p. 10), at least if that fold be defined with any consistency, e. g., *Pleurophyllidia*.

The gymnosomatous pteropods (p. 11) do not feed chiefly on *Thecosomata*, but on hydrozoa. The absence of a mantle is merely nominal, that organ being coincident with the integument, in any practical view. The arrangement of the Decacerate cephalopods is antiquated (p. 24); *Spirula* is undoubtedly Oigopsid.

Throughout the work (cf. p. 26) conchioline is more or less confused with chitine. The periostracum of bivalves is referred to as chitinous, by the majority of writers, as well as Lang, but long ago Loew showed that the chitine of mollusks (jaws and radula) does not give a saccharine reaction with sulphuric acid, and is not therefore identical with ordinary chitine, while the conchioline of the periostracum and test is purely horny, dissolving with ease in liquor potassæ and in no respect chitinous.

The spines of *Amphineura* are homologized with the shell of *Chiton* (p. 29) and later the tegmentum of the chiton and its 'aesthetes' are correctly homologized with the corium of the girdle and its spines; it seems surprising, therefore, especially when the embryology of *Dondersia* and *Chiton* is considered, to find (p. 40) an attempt at homologizing these cuticular structures not only with the true shell (articulamentum) of *Chiton*, but even with the shell of mollusks in general. The shell of *Argonauta* (p. 38) is a product of secretion from the cuticle,

serving the purpose of an oöphore, and should not be homologized with the protoconch and concha of other cephalopods. The figure of *Chitonellus* (more properly *Cryptoplax*) is taken from a very contracted spirit specimen and fails to show the proper proportions of the foot. Speaking of the concrescence of the mantle margin in Pelecypoda (p. 51), it should be stated that several superanal foramina occur in *Naiades* occasionally, and the fourth ventral orifice in *Pholadomya*, etc., is with little doubt correlated with the opisthopodium and not with the byssus. We find no reference to the opisthopodium in the book. The extensive concrescence of the mantle edges (p. 52) is not 'always' accompanied by 'well developed siphons,' e. g., *Tridacna*, *Chama*; and the same examples show that the statement that in sessile forms the mantle is found completely open is far from being generally true.

In discriminating the ligament and resilium the latter is said (p. 61) to be elastic and the former not so; in fact, both are elastic and the resilium adds resiliency to its tensional elasticity. Paleontology shows the error of the statement (p. 63) that the Pectinidæ are probably derived from sessile forms. The gape in many bivalves is accounted for (p. 64) by 'the greater development of siphons and foot' which is merely an incident of the gaping; the true reason is to be sought in the less need of shelly protection among deep burrowers; *Pholads* (p. 65) are said to rasp the stone by the edges of the valves. While this is true of certain forms like *Teredo*, in many others, including most *Pholads*, the rasping is done by the surface of the foot. The snout in *Capulus* (p. 102) is erroneously stated to be not invaginable. It is really invaginable from the base, much as in *Dolium*. The filamentous 'tentacles' (= captacula) of Scaphopods are not homologous with the tentacles of Gastropoda. In treating of the epipodium, mention might have been made of its modification to serve as a seminal conduit in certain Trochids. The *Unionidæ* (p. 115) are not, as a rule, mud dwellers. The musculation of *Chiton* (p. 120) has recently been fully described by Lillian Sampson. The statement that the muscles of mollusks are never striated (p. 119) is not true literally (p. 124), but the

differences between their striation and that of vertebrates should have been explained. Burne has recently shown that a supræesophageal commissure exists in *Hanleyia abyssorum* and probably in other chitons, as well as one (p. 129) below the œsophagus. *Cassidaria* (p. 163) does not belong to the *Toxiglossa*. The jaw, frequently, and the radular teeth always are not, as stated (p. 177), composed of conchioline, but of a special sort of chitine. The basal membrane of the radula (p. 181) is not 'rough' and not formed of conchioline. The transverse rows of the teeth (p. 182) properly counted invariably resemble one another; an alternation of discrepant rows is unknown, except as a blunder in defining the row. The accepted name of the central teeth is rhachidian, and not rhachial. In certain *Toxiglossa* the basal membrane of the radula is represented by two separated very narrow strips. The sucker-like organ on the proboscis of *Natica* is probably an organ of prehension; there is no evidence that it has anything to do with the boring by which the animal penetrates bivalve shells. In the naiades (p. 262) the young are not always developed in the outer gill, but also in the inner or in both, in some cases. The marine *Philobrya* also has a glochidium, while the whole family of *Mutelidæ* are without this commensal stage.

The above inaccuracies are due largely to the habit of anatomists of generalizing too widely on a too slender basis of observation. This might once have been excusable, but fortunately is rapidly becoming no longer so.

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Die Bronzezeit in Oberbayern. By VON DR. JULIUS NAUE. 4°, pp. 292. With album of fifty plates. Piloty & Löhle, Munich.

Southwest of Munich, amid the lovely scenery which surrounds the Ammer and Staffel Lakes, a number of sepulchral tumuli were discovered some years ago, which on investigation dated back to the age of bronze, ranging in time from its earlier to its later periods. Fortunately for prehistoric science, they attracted the attention of Dr. Julius Naue, of Munich, and he set about their thorough and accurate examination. For fifteen years he has personally ex-

plored them, spade in hand, surrounding his digging with those numerous precautions which the field archæologist should always respect.

Before his researches, practically nothing was known of the conditions of the peoples of the bronze age in the region indicated. By the opening of more than three hundred burial mounds and the sedulous study of their contents, he is able in the handsome volume named above to offer an almost complete restoration of the culture of that remote epoch.

In the older graves there are abundant utensils, weapons and ornaments of bronze; bowls, jars and plates in earthenware, frequently in artistic forms and decorated externally in lines and spirals; and a quantity of amber. No other metal was exhumed. Only in the later graves very small objects in gold and pearls of glass appear, but iron and silver continue unknown.

The text presents first the notes of each excavation. Then follow detailed descriptions of the weapons exhumed, the tools and utensils, articles of ornament and pottery. Special studies are appended on the material and technique of the objects, their form, style and ornamentation, and the inferences which they enable the student to draw regarding the people who left these memorials of their presence. The conclusions on the last topic are unexpected. We find ourselves in the presence of an industrious and peaceable community, depending on agriculture almost exclusively, cultivating the soil diligently and raising herds of cattle. They wore woollen clothing, with ornamented leather belts and decorated with bronze plates. They were of good stature, the men 1.65-70, the women 1.60-65. They were firm believers in a life after death, and surrounded the corpse with such objects as it was supposed to require in its wanderings in spirit land. Women took a high rank in the community as queens and priestesses. Some of the most elaborate of the interments preserved their remains only.

The culture was a progressive one. It can be traced from the neolithic time through the whole of the bronze age down to the epoch when the Roman forays destroyed it. Slowly but steadily it had increased, and for centuries