

GEOGRAPHY AND ARCHÆOLOGY OF PERU.* — While in England recently, Mr. Squier was induced by his friends to reprint in pamphlet form the paper which he read before the American Geographical Society in February last. We gave an abstract of that portion of the lecture which related to the Archæology of Peru in the *NATURALIST* for September; but the present pamphlet contains much interesting and important information relating to the geography of the great Titicaca basin to which we did not allude in our former notice, and will well repay reading by all interested in this great centre of a prehistoric nation.

NATURAL HISTORY MISCELLANY.

ZOOLOGY.

MORPHOLOGY AND ANCESTRY OF THE KING CRABS. — In a communication to the Boston Society of Natural History, Oct. 17, 1870, Dr. A. S. Packard, Jr. stated that a study of the embryology of *Limulus*, as well as its anatomy, led him to consider, as several authors had done, from Savigny and Van der Hoeven down to the present time, the anterior division of the body as a cephalothorax, the posterior division being the abdomen. Latreille, Milne-Edwards, and more recently Mr. Henry Woodward, † the distinguished palæontologist, have regarded the anterior division of the body as the head, and the posterior division as embracing the thorax and abdomen, the last three segments in Mr. Woodward's opinion, including the telson, representing the abdomen. Against this view he thought could be brought the embryological facts already stated at the meeting of the American Association for the Advancement of Science at Troy. He there stated that the germ first started as a Nauplius and that just previous to moulting a Nauplius-skin in the egg, the abdomen was differentiated from the cephalothorax. In this latter region (composed of six segments) are contained not only the eyes, simple and compound, but all the ambulatory appendages, which surround the mouth and are true maxillipeds, no antennæ or thoracic appendages being developed. This region contains the stomach and a considerable portion of the intestine, and the liver, which opens into the intestine near the middle of the cephalothorax, sending but a single pair of biliary tubes into the abdomen. The anterior half of the dorsal vessel, with two pairs of arteries and two pairs of valvular openings, is situated in the cephalothorax.

* Observations on the Geography and Archæology of Peru. By E. G. Squier, M.A., F.S.A. etc. 8vo. pamph. London. Trubner & Co., 1870. (Price 25 cents. Address Naturalists, Agency.)

† On some Points in the Structure of the Xiphosura. Quarterly Journal of the Geological Society of London for Feb. 1867.

Lastly, the genital openings in both sexes are situated on the first pair of abdominal lamellate appendages, the testes and ovaries lying wholly in the cephalothorax; the ovaries, when distended with eggs, filling up the front of the cephalothoracic shield.

The abdomen consists of nine segments, the long spine-like telson forming the ninth, as seen plainly in the embryo. The abdominal cavity is small, the abdomen being very thin, and mainly filled with the muscles attached to the lamellate feet.

There are, then, in *Limulus*, no thoracic feet, comparable with those of the Decapods and the Tetradecapods, and the thoracic region (as much of it as exists), is merged with the head, in fact never becoming differentiated from the head proper. Thus we have in *Limulus* a crustacean with the body divided into two regions; a cephalothorax (the thorax being potential, viewed externally, with no appendages or segments to indicate its existence) and a nine-jointed abdomen.

This disposition of the body-segments is paralleled by the zoëa, or young, of the Decapods. In the freshly hatched zoëa the body is divided into two regions; the cephalothorax, with no trace at first of thoracic segments, or thoracic appendages, (the two pairs of large feet being deciduous maxillipeds), the thorax not being yet differentiated; and a five-to-seven-jointed abdomen. The size of the cephalothorax, as compared with the abdomen, varies greatly in the different forms of zoëæ, some zoëæ strongly resembling *Eurypterus* in the small cephalothorax. After the first moult five pairs of rudimentary thoracic limbs arise at the hinder portion of the cephalothorax, thus proving our statement that the cephalothorax of *Limulus*, and consequently the so-called "head" of *Eurypterus* and *Pterygotus*, combines a head with a potential thorax, the latter never becoming differentiated in subsequent moults.

In the Trilobites, however, according to the late discovery of Mr. Billings, the thoracic segments bearing jointed feet are developed; though, as shown by Barrande, the larval trilobite is hatched either without any, or with but a single, thoracic segment. *Limulus*, *Eurypterus*, *Pterygotus*, and their allies (Huxley has aptly compared the *Eurypteridea* to a zoëa), with the Phyllopods, may be considered as virtually zoëæ, or to be more precise, (since they lack many important characters of zoëæ), retarded or retrograde zoëæ.

Speculating on the ancestry of the members of the subclass* of Branchiopoda, he would trace them all to a common Nauplius form, as Haeckel, Fritz Müller, and Dohrn had done. This Nauplius form may have existed in the Laurentian Period, as we already find highly organized Trilobites, Phyllopods, and Ostracodes in the lowest Silurian strata. He

*Though in his communication to the American Association he has spoken of the Branchiopoda as an *order*, of which he regarded the Pæcilopectera as a suborder, he thought the term *subclass* preferable, as, with the subclasses Decapoda and Tetradecapoda, etc., they were much more general groups than the orders of Vertebrates as first limited by Linnæus, whose idea of an order we should follow for the sake of uniformity, just as the term *family* should be applied in the sense in which Latreille used it.

suggested that the modern Phyllopods, such as *Apus* and *Branchipus*, may have descended perhaps, by two parallel lines of descent from certain Silurian Copepoda and Ostracoda. He accounted for the origin of these forms rather by a process of acceleration and retardation of development as suggested by Messrs. Cope* and Hyatt,† involving a more or less sudden formation of generic forms, than by the theory of Natural Selection, which involves an indefinite number of slight modifications for the production of even a variety, and such a succession of intermediate generic forms as we do not find recent or fossil. He also thought that the study of the facts of Dimorphism and Parthenogenesis, and the mode of production of the more remarkable sexual differences among animals, would throw light on a comprehensive theory of evolution.

THE ANCESTRY OF INSECTS. — Referring to his discovery of *Pauropus* in this country, and mentioning the six-legged form of the young, and its resemblance to *Podura*, and comparing it with the Hexapodous young of *Julus* and the young of certain mites, Dr. Packard, at the same meeting, referred the ancestry of the Myriapods, Arachnids, and Hexapodous Insects to a *Leptus*-like terrestrial animal, bearing a vague resemblance to the Nauplius form among Crustacea, inasmuch as the body is not differentiated into a head, thorax or abdomen, and there are three pairs of temporary appendages. Like Nauplius, which was first supposed to be an adult Entomostracan, the larval form of *Trombidium*, had been described as a genus of mites under the name of *Leptus* (also *Ocypete* and *Astoma*) and was supposed to be adult.

For this primitive, ancestral form he proposed the term *Leptus*. He suggested that the ancient *Leptus* may have descended through *Demodex* from some Tardigrades, and that this latter group had perhaps descended through some form like *Linguatula*, from a true terrestrial worm, like the remarkable *Peripatus*, for example. The Myriapods may, through a parallel line of descent, have been evolved from some Leptiform animal like the young of *Pauropus*, while the Hexapoda may have descended by a parallel line of descent through some Leptiform Silurian insect resembling the young of *Stylops*, *Meloe*, and low neuropterous or orthopterous larvæ, and the Thysanura, such as *Podura* and *Lipura*. He did not regard the insects as having been evolved either from a zoëa or Nauplius form, but would refer the ancestry of both classes (the Insects and Crustacea), independently of each other, to the worms (Annulata).

MONTEREY IN THE DRY SEASON. — On returning to the coast from the Colorado valley in May, 1861, my health impaired by the tropical heat of the last two months at Fort Mojave, and by the too sudden change to the foggy climate of the coast, I was glad of the opportunity of recruiting it by some weeks devoted to collecting marine animals, etc., at Monterey.

* Origin of Genera. Philadelphia. 1863.

† Parallelism between the order and individual in the Tetrabranchiate Cephalopods. Memoirs of the Boston Society of Natural History, 1866, and AMERICAN NATURALIST, Vol. 4, pp. 230 and 419.