

fauna of Siberia, its uniformity and conformity to the European fauna, on the meaning to be given to the species, on their variability and on the multiplicity of false ones published, on the complexity of their respective geographical areas, on their extinction and replacement by others, &c., are deserving of the careful study of all naturalists. L. v. Schrenck's Mollusca of the Amur land or Manchuria (reviewed in the "Zoological Record," iv. p. 504) is equally to be recommended for the manner in which the specific relations, the variability, affinities, and geographical distribution of Manchurian Mollusca are treated. The publications of the first meeting of the Association of Russian Naturalists include a review of the Crustacea of the Black Sea by V. Czerniavski, an account of the Annulata Chætopoda of the Bay of Sebastopol by N. Bobretzki, and a paper on the zoology of the Lake of Onega and its neighbourhood by K. Kessler, including a review of the fishes, Crustacea, and Annulata of the Lake of Onega, and of the Mollusca collected in and about the Lakes Onega and Ladoga, and a list of the butterflies of the Government of Olonetz. The historical and scientific memoirs published by the University of Kazan, of which several volumes have recently reached us, include a systematic enumeration and description of the birds of Orenburg (329 species), with detailed notes of their habits, &c., by the late Prof. E. A. Eversmann, edited after his death by M. N. Bogdanoff, forming an 8vo volume of 600 pages in the Russian language.

There is not in Russia at the present moment sufficient encouragement on the part of the public to induce the publication of independent biological works beyond a few popular handbooks; but the Imperial Academy of Petersburg has, on the other hand, been exceedingly liberal in the assistance it affords, and active in its issue of Transactions with excellent illustrations, as well as of its bulletin of proceedings. The volumes recently received include J. F. Brandt's "Symbolæ Sirenologicæ" and researches on the genus *Hyrax* (reviewed in "Zoological Record," v. p. 3, and vi. p. 5), A. Strauch's Synopsis of Viperidæ, with full details of their geographical distribution, E. Metschnikoff's studies on the development of Echinoderms and Nemertines, and N. Miklucho-Maclay's Memoir on Sponges of the N. Pacific and Arctic Oceans, with remarks on their extreme variability inducing the multiplication of false species. In botany, Bunge's Monograph of the Old-World species of *Astragalus* is the result of many years labour and careful investigation. The eight sub-genera and 104 sections into which this extensive genus is divided appear to be very satisfactory; but the species (971) are probably very much too numerous, and we miss that comparison with American forms which, considering the very numerous cases of identity or close affinity, is essential for the due appreciation of the N. Asiatic species. Bunge has also published a monograph of the *Heliotropia* of the Mediterranean-Oriental region in the Bulletin of the Society of Naturalists of Moscow, which continues its annual volumes. The parts recently received continue several of the botanical enumerations already noticed, together with various smaller entomological papers.

(To be Continued)

GEOLOGY

On the Supposed Legs of the Trilobite, *Asaphus platycephalus**

AT the request of Mr. E. Billings, of Montreal, I have recently examined the specimen of *Asaphus platycephalus* belonging to the Canadian Geological Museum, which has been supposed to show remains of legs. Mr. Billings, while he has suspected the organs to be legs so far as to publish on the subject,† has done so with reserve, saying, in his paper, "that the first and all-important point to be decided, is whether or not the forms exhibited on its under side were truly what they appeared to be, locomotive organs." On account of his doubts, the specimen was submitted by him during the past year to the Geological Society of London; and for the same reason, notwithstanding the corroboration there received, he offered to place the specimen in my hands for examination and report.

Besides giving the specimen an examination myself, I have submitted it also to Mr. A. E. Verrill, Prof. of Zoology in

* From the American *Journal of Science and Arts*, Vol. 1, May, 1871.

† Q. J. Geol. Soc., No. 104, p. 470, 1870, with a plate giving a full-sized view of the under surface of the trilobite, a species that was over four inches in length.

Yale College, who is well versed in the Invertebrates, and to Mr. S. I. Smith, assistant in the same department, and excellent in crustaceology and entomology. We have separately and together considered the character of the specimen, and while we have reached the same conclusion, we are to be regarded as independent judges. Our opinion has been submitted to Mr. Billings, and by his request it is here published.

The conclusion to which we have come is that the organs are not legs, but the semi-calcified arches in the membrane of the ventral surface to which the foliaceous appendages or legs were attached. Just such arches exist in the ventral surface of the abdomen of the *Macrura*, and to them the abdominal appendages are articulated.

This conclusion is sustained by the observation that in one part of the venter three consecutive parallel arches are distinctly connected by the intervening outer membrane of the venter, showing that the arches were plainly in the membrane, as only a calcified portion of it, and were not members moving free above it. This being the fact, it seems to set at rest the question as to the legs. We would add, however, that there is good reason for believing the supposed legs to have been such arches in their continuing of nearly uniform width almost or quite to the lateral margin of the animal; and in the additional fact, that although curving forward in their course toward the margin, the successive arches are about equidistant or parallel, a regularity of position not to be looked for in free-moving legs. The curve in these arches, although it implies a forward ventral extension on either side of the leg-bearing segments of the body, does not appear to afford any good reason for doubting the above conclusion. It is probable that the two prominences on each arch nearest the median line of the body, which are rather marked, were points of muscular attachment for the foliaceous appendage it supported.

With the exception of these arches, the under surface of the venter must have been delicately membranous, like that of the abdomen of a lobster or other macruran. Unless the under surface were in the main fleshy, trilobites could not have rolled into a ball.

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SCIENTIFIC SERIALS

Annales de Chimie et de Physique. The whole of the last part of the "Annales" is occupied by M. Berthelot's *Méthode universelle pour réduire et saturer d'hydrogène les composés organiques*, which is a résumé of the elaborate and exhaustive researches on the action of hydriodic acid on organic substances in which he has been engaged for the last three or four years. Most of the results have been already published from time to time in the *Bulletin de la Société Chimique de Paris*, and this classical research is now completed by the publication of the details of the methods of analysis and the thermochemical considerations involved. The author has found that any organic compound can be transformed into a saturated hydro-carbon, having, in general, the same number of atoms of carbon as the original substance, by heating it for a sufficient length of time to a temperature of 275°C., with a large excess of an aqueous solution of hydriodic acid of the specific gravity of 2.0. The proportion of the acid is varied according to the nature of the substance submitted to its action, twenty or thirty parts being sufficient to reduce an alcohol of the fatty series, whilst a member of the aromatic series and such substances as bitumen, wood charcoal, and coal, require, at least, one hundred times their weight; the large excess of acid serving the purpose of dissolving the iodine set free during the reaction, thus preventing its destructive action on the organic compound, and also in allowing the quantity of hydriodic acid necessary for the reduction of the substance, to be withdrawn from the solution without reducing its strength so far that the reaction ceases. One of the most remarkable results exhibited in the application of this method is that of the direct transformation of benzene into the saturated hydrocarbon, hexylene hydride, $C_6H_6 + 8HI = C_6H_{14} + 8I$, affording, as it does, an instance of a direct passage from the aromatic to the fatty series. When other members of the phenyl series are treated with hydriodic acid, the ultimate product is the same; but there is an intermediate step in the reaction, resulting in the formation of benzene, which, by the continued action of the acid, is transformed into the corresponding saturated hydrocarbon. The fifth and last part of the paper is