

at Zakro, on the eastern coast of Crete, identified by Spratt with the site of Itanos, described by him in pp. 121-149 of the "Annual," are of great importance, not only as giving us much new knowledge of Mycenaean house-building, but as throwing light upon the question of Mycenaean connections with Libya. The use of bricks for the upper courses of house-walls is now proved. The bricks were large and flat, the largest measuring $24 \times 16 \times 4$ inches, and "well and squarely laid" (p. 130). In the houses, besides vases, bronze implements, &c., was found a large number (nearly 800) of clay sealings, bearing impressions of intaglios, three of which are figured by Mr. Hogarth (Fig. 45; see Fig. 2 below). These "Minotaur" types are in the highest degree curious. This female figure with a bull's head; this bull-headed woman with a bird's wings and tail—are they mere fanciful designs, or do they point to the veneration of some strange androgynous deity?

However late in the Mycenaean age the existing remains of the settlement may be placed, "these were still anterior to the Age of Iron," says Mr. Hogarth (*italics in original*). . . . "Nor were any fragments observed of distinctly geometric vases. . . . The fact that the remains . . . come to a clean and abrupt finish with" the close of the Bronze Age, "showing no admixture of remains of the succeeding epoch, is in favour of those who hold that the use of iron and the



FIG. 2.—Clay Seal. Impression from Zakro.

inception of the geometric style resulted from some violent and radical social change in the Egean, such as conquest by a distinct race" (p. 146). Whether this was an Achaian or a Dorian conquest, Prof. Ridgeway and his critics must settle: personally, we still prefer the second alternative.

The settlement is regarded by Mr. Hogarth as a trading outpost of Knossos, and in view of the objects of Knossian type discovered, this view seems a very probable one.

"Its position," he says (p. 147), "indicates that Zakro traded with Libya direct, and not (as has been supposed) by a circuitous route through Rhodes and Cyprus." While still holding to his view that the circuitous route, by which we know came the great armament which attacked Egypt in Rameses III.'s time, in which it is possible that Cretan Axians were included,¹ was the most likely one for primitive navigators to follow, the present writer is inclined to think that he has, in "The Oldest Civilization of Greece," to some extent underestimated the possibility of direct communication in Mycenaean times between Crete and Libya. The bay of Zakro, remarks Mr. Hogarth (p. 123), "is the best known rendezvous and port of call for the fishing fleets of the eastern islands, which sail annually to the sponge-grounds off the Libyan shore. . . . For sailing craft the bay of Zakro is still the principal station on the road from the Aegean to Libya."

¹ It is true that Axos was an inland town but this was no bar to its having taken part in an over-sea expedition: see also Herodotos, iv. 154, which should not be forgotten.

The argument is a fair one, but we have no certainty that Mycenaean sailors were as familiar with the direct route to Africa as the modern sponge-fishers. The geographical objection to the theory of direct connection, which has been stated to be non-existent, is simply the absence of any coast leading the primitive voyager from Crete to Libya; he would naturally follow the coast round, as the later Greeks went from Greece to Sicily, and not sail south into an open and unknown sea. However this may be, space forbids the further discussion of the point here.

Mr. Hogarth appends a description by Dr. Boyd-Dawkins of proto-Mycenaean dolichocephalic skulls found by him, which the distinguished craniologist pronounces to possess characters which "point unmistakably to the fact that the possessors of the skulls . . . led the artificial life of highly civilised peoples" (p. 151). These skulls are regarded by him as belonging to the long-headed Pelasgic or Mediterranean stock of Sergi, which is what we should have expected.

The review of last year's "Annual" spoke of it as "the most important contribution to our knowledge of the early history of mankind that has appeared for many years" (NATURE, lxiv. p. 15). It can only be said of this year's number that in interest and importance it suffers very little by comparison with No. VI. H. H.

ALEXANDER KOWALEVSKY.

THE illustrious Russian embryologist and student of the anatomy of lower animal forms, Kowalevsky, died, to the great grief of the whole zoological world, on November 22, 1901, of an attack of apoplexy.

Kowalevsky was one of those rare men whose name is associated by all his contemporaries with a new departure in the branch of science which he cultivated. Albert Kölliker, still alive and well, had as long ago as 1844 followed with his microscope and drawn the division of the single cell constituting the egg of the cuttlefish, and had traced the process of the formation of the mass of embryo-cells by division of the cells resulting from the cleavage of the first or primary egg-cell. Remak, in 1850-58, had traced the evolution of definite tissues from the embryonic cells, and later students of the embryo chick had followed out the earlier indications of von Baer and were busy with the discussion of the origin and outcome of the embryonic layers of cells. But Kowalevsky went further than this, and in small transparent embryos (such as those of *Ascidia*, *Amphioxus*, *Sagitta* and *Argiope*) traced the history of adult organs cell by cell to the original egg-cell. It is this procedure which must immortalise Kowalevsky. Ten years after his first papers were published, the aim which he had given to embryological science became the definite and recognised purpose of successive generations of embryologists in England, Germany and the United States. Before Kowalevsky's work on the development of *Amphioxus*, carried out in 1864-65, and on *Ascidia* in 1866, zoologists were content to regard the cell-masses resulting from the first cell-divisions of the animal egg-cell as intricate heaps of units which no one could expect to analyse. Some way was made in the direction of their comprehension by the application to invertebrate embryos of the doctrine of cell-layers, but it was not until the avowed purpose of the embryologist became the definite tracing of the genesis of the cells of cell-layers one by one from pre-existing cells and finally from the first cell-divisions of the egg-cell that Kowalevsky's work bore its full fruit, and a thorough-going cellular embryology was established. Much still remains to be done on this basis, but we see it clearly foreshadowed in Kowalevsky's great memoirs on the development of *Amphioxus* and of *Ascidia*, wherein the identity of the nervous system, the

notochord, the alimentary canal and the primitive branchial slits of those two apparently unrelated animals is shown by the method of tracing the exact derivation of the cells constituting those organs in the two cases.

Kowalevsky published several embryological memoirs on Sagitta, Alcyonians, Holothurians, Argiope, Hydrophilus, Chiton and other forms, in which exact observation of the cell-lineage was his purpose and his result. His writings are singularly free from generalising theory; his delight and his power lay in the making and recording of exact observations destined to build up our understanding of animal structure on a sound basis. His later zoological researches included some minute studies on the anatomy of the vascular system in insects and some novel and important researches on the phagocytes of lower animals. He collaborated for a time with Marion, of Marseilles, and wrote with him on the Neomenians (Solenogastres). He was the discoverer of the planariform dwarf male of Bonellia, and was the first to describe the anatomy of the Balanoglossus of Della Chiaje and to demonstrate its perforate pharynx. In his last years he was occupied with researches on the structure of the leeches (especially the rare and extremely interesting setigerous leeches of the genus *Acanthobdella*) from Russian fresh waters, and on some other strange worm-like forms (the Hedyliidæ) from the Sea of Marmora.

Alexander Onufrievitch Kowalevsky was born on November 20, 1840, in a country house situated not far from Witebsk, in the north-west of Russia. His father was a Pole and his mother a Russian. After his early education at home he was placed at the Engineering School of Roads and Highways at St. Petersburg. But he preferred the study of science to a practical career, and entered the faculty of natural sciences of the University. The University disturbances of 1861 obliged Alexander Kowalevsky to quit Russia and pursue his studies abroad. He went in the first instance to Heidelberg, where he was for some time a pupil of Bunsen. He actually published two small memoirs of a purely chemical nature under the guidance of the great German chemist. But very soon Kowalevsky's taste for zoology and comparative anatomy declared itself. After studying with Bronn and with Pagenstecher, Kowalevsky passed on to Tübingen, where he became the assiduous pupil of Leydig (still living and honoured in his old age). It is there that the young Russian learnt histological methods and prepared himself for his delicate researches on the anatomy and embryology of the lower animals. In 1864 he published in Russian his first zoological work, which was entitled "The Anatomy of *Idothea*." The paper contains anatomical details as to this Isopod, which is very common in the Bay of Finland. After having "passed his licentiate" (the equivalent of a bachelor's degree in England) at St. Petersburg, Kowalevsky went in 1864 to Naples with a definitely-thought-out programme of researches on the lower animals. He spent about eighteen months there (there was no Stazione Zoologica in those days), and it is there that he carried out his beautiful researches on the embryology of *Amphioxus* and of many other marine forms (*Argiope*, *Sagitta*, *Holothurians*, &c.), and also made his important discoveries as to the anatomy of *Balanoglossus* (revealing for the first time its curious branchial structure), which he subsequently published. In 1865 he had to return to St. Petersburg to pass his examination for the degree of "magister zoologiæ," and presented his memoir on *Amphioxus* as his inaugural thesis. He then returned to Naples, and at Ischia in 1866 he made his researches on the development of *Ascidia*, which he published in the course of the same year. It was this memoir, taken in conjunction with his similar discoveries with regard to *Amphioxus*, which startled the zoological

world, led to the recognition of the *Ascidians* as *Vertebrata*, gave a new impulse and direction to embryological research, and among other things led to the development of the important doctrine of degeneration as applied to other than parasitic animals.

An epitome of Kowalevsky's researches on *Ascidia* and *Amphioxus* was written by Prof. Michael Foster at the request of the editors of the *Quarterly Journal of Microscopical Science* in 1870, and zoologists were divided into those who had and those who had not "bowed the knee to Kowalevsky." Kowalevsky, after being for a time "privat docent" at the University of St. Petersburg, was appointed professor extraordinarius at Kazan in 1868, professor ordinarius at Kiev in 1869, and at Odessa in 1874. He remained at Odessa until 1890, when he was made "titular member" of the Academy of Sciences of St. Petersburg. He was professor of histology during two years at the University of St. Petersburg, but later concentrated his activity on the Academy of Sciences and occupied himself much with the biological station at Sebastopol, of which he was director. Besides being a foreign member of the Royal Society, Kowalevsky was a member and correspondent of a great number of scientific academies, and was decorated by the Emperor of Germany with the order "pour le mérite." He was married in 1868 and was the father of one son and two daughters. His son is a chemist, and one of his daughters (Madame Tchistovitch) is a doctor of medicine; the other is married to M. Cheviakoff. The celebrated mathematician Sophie Kowalevsky was the wife of a younger brother of Alexander Kowalevsky, the same who published some valuable work on mammalian palæontology about thirty years ago and died a few years later.

Personally Kowalevsky was a man of retiring disposition, devoted to his microscopic work, and of the most gentle and courteous address. He visited England with one of his daughters in October, 1895, for a few days, but took alarm at the dangers of the London streets and left somewhat abruptly.

The writer is indebted to his and Kowalevsky's friend, Prof. Elias Metschnikoff, of the Institut Pasteur, Paris, for the biographical details above given. Prof. Metschnikoff is preparing a biography of Kowalevsky for publication. A list of Kowalevsky's publications is given below.

E. RAY LANKESTER.

List of Papers by Alexander Onufrievitch Kowalevsky.

- (1) Anatomy of the marine cockroach *Idothea entomon*, and list of the Crustacea which are met with in the freshwaters of the St. Petersburg Government. [In Russian.] (*Estest. isslyed. St. Petersb. gub. (Russ. Entomol. Obshchest. S. Petersb.)*, 1864, Tom. i).
- (2) Le développement de l'*Amphioxus lanceolatus*. (*Archives Sci. Phys. Nat.*, xxvii. 1866, pp. 193-195; *Ann. Mag. Nat. Hist.*, xix. 1867, pp. 69-70; *St. Petersb. Acad. Sci. Mém.*, xi. 1868, No. 4).
- (3) Beiträge zur Anatomie und Entwicklungsgeschichte des *Loxosoma Neapolitanum*, sp. n. [1865.] (*St. Petersb. Acad. Sci. Mém.*, x. 1867, No. 2).
- (4) Anatomie des *Balanoglossus*, Delle Chiaje. [1866.] (*St. Petersb. Acad. Sci. Mém.*, x. 1867, No. 3; *Ann. Mag. Nat. Hist.* xx. 1867, pp. 230-232).
- (5) Entwicklungsgeschichte der Rippenquallen. [1865.] (*St. Petersb. Acad. Sci. Mém.*, x. 1867, No. 4; *Ann. Mag. Nat. Hist.*, xx. 1867, pp. 228-229).
- (6) Entwicklungsgeschichte der einfachen Ascidien. [1866.] (*St. Petersb. Acad. Sci. Mém.*, x. 1867, No. 15; *Quarterly Journ. Microsc. Sci.*, x. 1870, pp. 59-69).
- (7) Untersuchungen über die Entwicklung der Coelenteraten. (Göttingen, *Nachrichten*, 1868, pp. 154-159).
- (8) Beitrag zur Entwicklungsgeschichte der Tunicaten. (Göttingen, *Nachrichten*, 1868, pp. 401-415; Halle, *Zeitschr. Gesamm. Naturwiss.*, xxxii. 1868, pp. 343-344).
- (9) Beiträge zur Entwicklungsgeschichte der Holothurien. [1866.] (*St. Petersb. Acad. Sci. Mém.*, xi. 1868, No. 6).

- (10) Die Entwicklungsgeschichte der Störe. [1869.] (*St. Petersb. Acad. Sci. Bull.*, xiv. 1870, col. 317-325; *Rev. Sci. Nat.*, 4, 1875-76, pp. 146-151).
- (11) Weitere Studien über die Entwicklung der einfachen Asciden. [1870.] (*Archiv. Mikrosk. Anat.*, vii. 1871, pp. 101-130).
- (12) Embryologische Studien an Würmern und Arthropoden. [1869.] (*St. Petersb. Acad. Sci. Mém.*, xvi. 1871, No. 12).
- (13) Ueber die Vermehrung der Seesterne durch Theilung und Knospung. (*Zeitschr. Wissensch. Zool.*, xxii. 1872, pp. 283-284).
- (14) Zur Anatomie und Entwicklung von *Thalassema*. (*Zeitschr. Wissensch. Zool.*, xxii. 1872, p. 284).
- (15) Ueber die geschlechtslose Fortpflanzung des *Amarœcium*. (*Zeitschr. Wissensch. Zool.*, xx. 1872, p. 285).
- (16) Ueber die Knospung der Asciden. (*Archiv. Mikrosk. Anat.*, x. 1874, pp. 441-470).
- (17) Sur le bourgeonnement du *Perophora lysteri*, Wiegmann. [Trad.] [1874.] (*Rev. Sci. Nat.*, iii. 1874-75, pp. 213-235).
- (18) Ueber die Entwicklungsgeschichte der Pyrosoma. (*Archiv. Mikrosk. Anat.*, xi. 1875, pp. 597-635).
- (19) Du développement des Actinies. [Trad.] [1875.] (*Rev. Sci. Nat.*, iv. 1875-76, pp. 15-26).
- (20) Du mâle planariforme de la Bonellie. (*Rev. Sci. Nat.*, iv. 1875-76, pp. 313-320).
- (21) Weitere Studien über die Entwicklungsgeschichte des *Amphioxus lanceolatus*, nebst einem Beitrage zur Homologie des Nervensystems der Würmer und Wirbelthiere. (*Archiv. Mikrosk. Anat.*, xiii. 1877, pp. 181-204).
- (22) Ueber die Entwicklung der Chitonen. Vorläufige Mittheilung. (Carus, *Zool. Anzeiger*, ii. 1879, pp. 469-473).
- (23) Zur Entwicklungsgeschichte der Alcyoniden *Symphodium coralloides*, M.-Edw., und *Clavularia crassa*, M.-Edw. (Carus, *Zool. Anzeiger*, ii. 1879, pp. 491-493).
- (24) Weitere Studien über die Entwicklung der Chitonen. (Carus, *Zool. Anzeiger*, v. 1882, pp. 307-310).
- (25) Observations on the Development of Brachiopods. [In Russian.] (Moscow, *Soc. Sci. Bull.*, xiv. 1874, pp. 1 (bis)-40 (bis)).—[Abstract.] (*Archives Zool. Expér.*, i. 1883, pp. 57-76).
- (26) Note on the author's journey to the Caspian Sea. [In Russian, 1869.] (*Kiev Soc. Nat. Mém.*, i. 1870, pp. 19-20).
- (27) Note on the structure of the alimentary canal in the Dendrocoela. [In Russian, 1869.] (*Kiev Soc. Nat. Mém.*, i. 1870, pp. 109-110).
- (28) Contribution to the embryology of the shark, from observations on *Mustelus laevis* and *Acanthias vulgaris*. [In Russian.] (*Kiev Soc. Nat. Mém.*, i. 1870, pp. 163-187).
- (29) Development of the ova in *Sterna-pis thalassomoides*, Otto. [In Russian.] (*Kiev Soc. Nat. Mém.*, i. 1870, pp. 287-290).
- (30) Contribution to the embryology of *Amphioxus lanceolatus*. [In Russian.] (*Kiev Soc. Nat. Mém.*, i. 1870, pp. 327-338).
- (31) Contribution to the embryology of the tortoise *Emys europaea*. [In Russian.] (*Kiev Soc. Nat. Mém.*, i. 1870, pp. 378-385).
- (32) Preliminary report to the Society of Naturalists of the Vladimir University on measurements in the Black Sea. [In Russian.] (*Kiev Soc. Nat. Mém.*, iii. 1873; *Proc.*, pp. 33-37).
- (33) Observations on the development of the Coelenterata. [In Russian.] (Moscow, *Soc. Sci. Bull.*, x. No. 2, 1874, pp. 1 (bis)-38 (bis)).
- (34) *Neomenia gorgonophila*. [In Russian, 1880.] (Moscow, *Soc. Sci. Bull.*, xxxvii. No. 1, 1881, pp. 181-186).
- (35) Embryogénie du *Chiton polii*, Philippi, avec quelques remarques sur le développement des autres chitons. (*Marseille Mus. Ann.*, i. 1883, No. 5, 46 pp.).
- (36) Étude sur l'embryogénie du Dentale. (*Marseille Mus. Ann.*, i. 1883, No. 7, 54 pp.).
- (37) On the history of the development of the Chitons. Preliminary communication. [In Russian.] (*Zapiski Novoross. Obshchest. Estest. Odessa*, Tom. viii. pt. 1, 1882).
- (38) On the preparation of the organs of some insects, spiders and centipedes. [In Russian.] (*Zapiski Novoross. Obshchest. Estest. Odessa*, xiv. pt. 2, 1889).
- (39) Observations sur les organes excréteurs des animaux invertébrés. (*Zapiski Novoross. Obshchest. Estest. Odessa*, xiv. pt. 1, 1889).
- (40) On the spleen of Mollusca. [In Russian.] (*Zapiski Novoross. Obshchest. Estest. Odessa*, xv. pt. 2, 1890).
- (41) Ein Beitrag zur Kenntniss der excretionsorgane der Pantopoden. (*St. Petersb. Acad. Sci. Mém.*, xxxviii. 1892, No. 12).
- (42) Einige Beiträge zur Bildung des Mantels der Asciden. (*St. Petersb. Acad. Sci. Mém.*, xxxviii. 1892, No. 10).
- (43) Une nouvelle Glande lymphatique chez le Scorpion de l'Europe. (*St. Petersb. Acad. Sci. Mém.*, v. 1897, No. 10).
- (44) Études anatomiques sur le genre *Pseudovermis*. (*St. Petersb. Acad. Sci. Mém.*, xii. 1901, No. 4).
- (45) Phénomènes de la fécondation chez l'*Haementeria costata*, Müller. [In Russian.] (*St. Petersb. Acad. Sci. Mém.*, xi. 1901, No. 10).
- (46) With Barrois (Jules), Matériaux pour servir à l'histoire de l'Anchinie. (Robin, *Journ. Anat.*, xix. 1883, pp. 1-23; *Ann. Mag. Nat. Hist.* xii. 1883, pp. 1-20).
- (47) With Marion (A. F.), Études sur les Neomenia. [1881.] (Carus, *Zool. Anzeiger*, v. 1882, pp. 61-64).
- (48) With Marion (A. F.), Sur le développement des Alcyonaires. (Paris, *Acad. Sci. Compt. rend.*, xcv. 1882, pp. 562-565).
- (49) With Marion (A. F.), Documents pour l'histoire embryogénique des Alcyonaires. (*Marseille Mus. Ann.*, i. 1883, No. 4, 50 pp.).
- (50) With Marion (A. F.), Contributions à l'histoire des Solenogastres, ou Aplacophores. (*Marseille Mus. Ann.*, iii. 1887, No. 1, pp. 76, 7 pls.).
- (51) With Ovsyannikov (F. V.), Ueber das Centralnervensystem und das Gehörorgan der Cephalopoden. [1866.] (*St. Petersb. Acad. Sci. Mém.*, xi. 1868, No. 3).
- (52) With Shulghin (M. A.), Zur Entwicklungsgeschichte des kaukasischen Scorpions, *Androctonus ornatus*. Preliminary communication. [In Russian.] (*Zapiski Novoross. Obshchest. Estest. Odessa*, xi. pt. 1, 1866, pp. 39-55).

And quite recent papers on leeches (*Acanthobdellidae*) and on the curious worm-like *Gastropods*, the *Hedyliidae* of the Sea of Marmora and Black Sea, published in the *Transactions* of the Imperial Academy of Sciences of St. Petersburg (the latter since his death).

NOTES.

THE Berlin official *Reichsanzeiger* announces that the order "Pour le Mérite" has been conferred upon Lord Avebury and Prof. A. Agassiz, of Harvard University.

THE Hugh Miller centenary will be celebrated at Cromarty to-morrow, August 22. At the public meeting addresses will be given by Mr. Arthur Bignold, M.P. (chairman), Sir Archibald Geikie, F.R.S., the Right Hon. James Bryce, M.P., Principal Rainy, D.D., and Prof. J. M. Clarke, of Albany, New York.

THE *Daily Mail* reports that millions of winged ants descended on the Bohemian watering-place of Teplitz in a dense cloud on Saturday, August 16. At Brussels also there were swarms of ants, and the streets in some places were so thickly strewn with their bodies that the firemen had to be called out to wash them away.

A REUTER message from Yokohama states that the small island of Tori Shima, which is one of a chain extending between the Bonin Islands and the main island of Japan, was overwhelmed by a volcanic eruption between August 13 and August 15. There were about 150 inhabitants, and the whole of them appear to have perished. The island is covered with volcanic débris and all the houses have disappeared. The eruption was still proceeding on August 18, together with a submarine eruption in the vicinity of the island, and passing vessels report that the place is dangerous of approach.

THE manager of the Eastern Extension, Australasia and China Telegraph Company sends us the following extract from a letter received from the superintendent at Banyuwangi, Java, dated July 6:—"The Rooang volcano, which is about thirty-five miles from