

occurrence of Shelly Boulder-clay in North Ronaldshay, found by Dr. Traill.

*H. Cadell.*—Recent Advances in West Lothian Geology.

*Professor F. Clowes.*—Barium Sulphate as a cementing material in Sandstone.

*A. G. Cameron.*—Notes on Fullers' Earth and its applications.

*Dr. J. C. Howden.*—Notes on the Glacial Deposits of Montrose.

*Alex. Ross.*—Notes on the Rocks of St. Kilda.

*C. E. De Rance.*—Report of the Committee on the Circulation of Underground Waters.

*W. Whitaker.*—On Deep Borings at Chatham. A Contribution to the Deep-seated Geology of the London Basin.

*W. Whitaker.*—On the Waterworks at Goldstone Bottom, Brighton.

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### CORRESPONDENCE.

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#### FOSSIL SLUGS.

SIR,—A correspondent has inquired whether any fossil slugs are known. Having unfortunately mislaid his letter, perhaps you will kindly permit me to answer the question in your pages.

*Testacella* is recorded from the Middle and Upper Miocene and Pliocene.

*Limax* from the Lower Miocene, upwards.

*Amalia* from the Upper Miocene.

*Parmacellina* from the Upper Eocene.

*Arion ater* from the Pleistocene.

*Vitrina*, *Succinea*, *Hyalinia* are found fossil in the Tertiaries, but scarcely perhaps enter the category of "slugs," a rather vague term.

Probably many other slugs are known as fossils in America, but it is of course only genera provided with some sort of shell that can possibly leave behind any fossil remains.

7, DAMER TERRACE, CHELSEA, Sept. 14, 1885. J. STARKIE GARDNER.

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### OBITUARY.

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#### HENRI MILNE EDWARDS.

BORN OCT. 23, 1800; DIED JULY 29, 1885.

With regret we record in our present issue another loss to Science—the loss of a Naturalist who for more than sixty years devoted himself with unswerving perseverance to the unravelment of the mysterious and wondrous phenomena of animal life: and we shall not be overstepping the limits of our record by preserving in its pages a brief sketch of the work of a man who, while ranking as a chief among zoologists, carried his researches into the domain of palæontology also.

Henri Milne Edwards, though born at Bruges—on October 23, 1800—was of English parentage. His father, Lieutenant-Colonel Edwards, had settled in that city after successful operations as a planter in Jamaica. His mother, Elizabeth Vaux, a second wife,

claimed descent from Sir Nicholas Vaux of Harrowden, first Baron Vaux. Henri was his father's twenty-seventh child. During the incarceration of Colonel Edwards in Belgium, on suspicion of aiding the escape of some prisoners, Henri was placed in the care of his eldest brother William, the eminent physiologist. Most reputations may be traced to the fostering of early inclinations, and that of Henri Milne Edwards had its incipience in a scientific analysis he essayed in his boyhood of Buffon's *Histoire des Animaux*. Educated for the medical profession, but dividing his leisure between painting and music, he took his M.B. degree at Paris in July, 1823, in which year he married Laure, daughter of Colonel Trézel. This union, which was one of affection, stimulated Edwards in the noble aims of his career. Thus early he addressed several memoirs to the Academy of Sciences, Paris, one of which, carefully elaborated with the assistance of F. Vavasseur, on the *Influence du système nerveux sur la digestion stomacale*, attracted considerable notice. It was a subject he continued later on in his mémoire, with G. Breschet, on the *phénomènes de la digestion*. Another paper printed at this dawning period (1823) deserves mention. It was his *Mémoire sur la structure élémentaire des principaux tissus organiques des animaux*. Two years later the necessities of an increasing family further stimulated his exertions. He published elementary treatises on medicine, and, conjointly with Vavasseur, the well-known *Manuel de matière médicale*, translated into the principal European languages. Edwards's passion for the study of Natural History at this time developed itself, and the numerous and admirable works which he brought out year by year threw new light on many of the problems of animal life. Hitherto, naturalists had been content to base their work on exterior characteristics, and the new and more philosophic departure inaugurated by Cuvier, namely, that in order to judge of the true relationship of animals, all their organs must be well understood, was followed up by Edwards with keenness and activity, especially in regard to modes of development; and the study of comparative anatomy and comparative physiology, *pari passu*, thus started, has been since accepted as the only true method of investigation in scientific research. Edwards may be said to have taken the lead in biological inquiry, and to have pioneered the geographical distribution of the lower forms of animal life. In order to arrive at a reasonable understanding of the plan governing the constitution of the animal kingdom he endeavoured to judge of causes by their effects; not that, for a single moment, he says, did he believe himself to be able to divine the mother-thought from which emanated the vast conception of life, nor to determine the route followed by the GREAT AUTHOR in the execution of His work. But Edwards went thus far to declare that, though he found that organisms are not really identical, the first condition imposed upon Nature in the formation of animals appears to be diversity of productions. It was his comprehensive and analytical method of exploitation constantly applied which realized the laws presiding over the organization of animated nature—laws which, put by him on a sure foundation, must be

understood by naturalists of the future. Edwards's life forms a trophy of laurels won in the prosecution of these views.

In the year 1826 he commenced with J. V. Audouin a series of researches on the anatomy and zoology of animals of the coasts of France, which he visited more particularly to study living forms and to investigate habits; and before the year had expired he gave the result of these researches in a work entitled *Littoral de la France*, a great part of which, concerned with annelids, was eulogized by Cuvier. The following year, in collaboration with the same naturalist, he published the remarkable studies in experimental physiology: *Recherches anatomiques et physiologiques sur la circulation dans les crustacés*—a work which obtained in 1828 the prize for physiology given by the Academy of Sciences. By this inquiry, as declared by Cuvier, he enriched the fauna of France with new and curious species, and zoology generally with interesting observations. The results were submitted to the Academy in July and November, 1829, and they form the subject of an elaborate report presented in November, 1830, by Cuvier, Dumeril, and Latreille, in which the first idea of zones of marine life was promulgated. The great principle discovered by these researches was that, the more an animal exhibits in its organs a division of labour, the higher it is in the scale of organization; and they obtained for Edwards the credit of being the founder of the morphology of crustaceous animals. Moreover, his work became the standard authority on the group. Although in 1832 Edwards was elected Professor of Natural History at Lycée Henri IV., and at the Central School of Arts and Manufactures, he produced several popular works on natural history, among which were the *Nouveau Formulaire pratique des Hôpitaux* and the *Éléments d'histoire naturelle* of A. Comte. The latter work was reproduced to the extent of a hundred thousand copies, and was re-issued in 1851 as a *Cours élémentaire de zoologie*.<sup>1</sup> The study of marine animals now absorbed Milne Edwards's attention. Astonished at the profusion and richness of forms yet unknown exhibited by the crustaceans in the galleries of the Musée d'Histoire Naturelle, he resolved to write a complete history of these animals. His work, printed in the years 1834—1840, and entitled *Histoire Naturelle des Crustacés* (3 vols. and atlas), bears on every page evidence of the author's remarkable powers of observation, as does also his article "Crustacea," contributed in this interval to Todd's Cyclopædia. A visit to the coasts of Algeria was undertaken in 1836, and the materials then collected were given to the scientific world in a series of memoirs styled *Recherches anatomiques et zoologiques sur les polypes*, one marked result being the separation of the polyzoa from the polyps, included together in the group of Radiata founded by Cuvier. The importance, number, and variety of his works had already surprised zoologists, and on the death of Cuvier, in 1838,

<sup>1</sup> This work was also translated into English by Dr. R. Knox (London 1856) and had a very large sale in this country. Many other copies of the work *not bearing Milne Edwards's name*, have been published "by English, Scotch, Irish, and American literary contrabandists."—(Knox).

Edwards was selected to succeed him in the Academy of Sciences in the Departments of Anatomy and Zoology.

The *Notice* of his works on this occasion included a résumé of sixty-six original memoirs, apart from numerous articles inserted in the *Dictionnaire Classique d'Histoire Naturelle*, and other similar publications. In this same year Edwards began the superintendence of the new edition of Lamarck's *Histoire Naturelle des non-vertébrés*, continued to 1845; and he was now charged with the class of anatomy and comparative physiology until then under the direction of Geoffroy Saint-Hilaire. These appointments, however, do not appear to have interfered with the progress of his special pursuits. In 1839, after further researches on the Coasts of la Manche, etc., continued the year following at Nice, he published, in a series of memoirs, the facts which he had gathered concerning the embryology and comparative anatomy of the Ascidians. Herein he gave the first definite account of the mode of reproduction by budding. The development of beings which before had never been utilized in the comparative study of animals appeared to him to constitute a subject of the highest value; and his speculations show how great a part embryology plays in zoological science. In 1841 he succeeded his friend J. V. Audouin as Professor of Entomology at the Museum of the Faculty of Sciences. Bent on making progress with the study of marine animals, Edwards conceived the idea of dredging up specimens from the bottom of the sea, particularly at great depths, and of bringing to light a submarine world of animal existence then unknown. The appliances for dredging were at that time of a primitive description, and he did not hesitate to risk his life in diving operations. This happened on the coast of Sicily, during a voyage undertaken in company with A. de Quatrefages and E. Blanchard. The results were considerable, and were explained in the work, *Recherches anatomiques et zoologiques faites pendant un voyage sur les côtes de la Sicile*. They form a splendid quarto volume of over 850 pages, illustrated with nearly 100 coloured plates. The work is for the most part a corrected report of the series of memoirs contributed to the *Annales des sciences naturelles*. On his return in 1844, Edwards was nominated Professor of Comparative Physiology to the Faculty of Sciences of Paris, and five years later he undertook the functions of Dean of the Sorbonne, an office which he held to the day of his death. The superintendence of the removal of the laboratories was a task which Milne Edwards successfully accomplished, to the great advantage of future students. In April, 1847, he was created an officer of the Legion of Honour, and was promoted, August 31, 1861, to the rank of a commander.

Jointly with Jules Haime, Milne Edwards published in the Palæontographical Society's volumes for 1850–54 a *Monograph of the British Fossil Corals*, and the next year a *Monographie des Polypiers fossiles*, both subjects being treated in a masterly manner, and forming a most solid contribution to palæontological knowledge. The year succeeding Edwards produced another long memoir—on the *Morphology of Crustacea*; and very shortly after his work on

the *Tendances de la Nature*, in which he gave forth his opinions on the vitality of different parts of organisms. We have additional evidence of the versatility of his genius about this period in further *Recherches sur les polyptiers* (eight memoirs, with Haime, 1848), a paper on the *mœurs de divers insectes xylophages* (1848), and a report on *pisciculture* (1850). Elected an Associé, in 1854, of the Academy of Medicine, in 1856 he visited London to receive from the Royal Society the Copley Medal, in presenting which the President declared that it would be a difficult task to name any one existing naturalist who had prosecuted his researches with success over so wide a range of investigation. On the death of Haime, in that same year, Edwards completed the *Histoire naturelle des Coralliaires ou Polyptères*, 3 vols. and atlas. On the 28th May, 1862, he succeeded Isidore Geoffroy Saint-Hilaire as Professor of Zoology at the Musée, of which shortly after he became Assistant-Director. In 1867 appeared his *Rapport sur les progrès récents des sciences zoologiques en France*. The *Leçons sur la physiologie et l'anatomie de l'Homme et des Animaux* were published between 1857 and 1881, in fourteen volumes. They were dedicated to his relative M. J. Dumas, and will always possess importance for the student from the immense amount of details, accompanied by copious references to the labours of others, which they contain in limited compass. On the appearance of the last volume, a portrait-medal of the author was struck by his pupils and admirers; at the same time the Society of Sciences of Holland designated him as the recipient of the Boerhave Medal, given for the most valuable works in Natural History. Various learned societies had enrolled Edwards among their members. Crowned with the honour and success of a long life devoted to the advancement of science, Henri Milne Edwards died at Paris on the 29th of July of the present year. The wide range of his knowledge of zoology has rarely been equalled; and it must be borne in mind that he laboured when the study of zoology was scarcely settled on a scientific basis. A glance at the Royal Society's catalogue of papers to 1868 will at once be convincing in regard to his work; 106 papers are placed to his credit alone, while thirty appear in connection with other well-known men of science. Generation, changes of form, mode of growth, mechanism of respiration, forms of blood-corpuses, the nervous system, circulatory apparatus, geographical distribution, are among the subjects treated in the side-walks as we may term them of his career.

Personally, Milne Edwards was of a delicate constitution, and the interest excited by his discoveries may be said to have prolonged his life to the advanced age he reached. He was a good linguist, his English and French being perfect. His love for France and its people displayed itself in many instances of bravery and self-sacrifice during the cholera epidemic of 1832 and the Franco-German war which broke out in 1870. His rare qualities and generous nature will be missed by many a student and confrère, while the scientific world will mourn the loss of the remarkable powers of elucidation and classification evidenced by his life-long labours.—T.N.