

and of the Bureau des Longitudes, and was for some time a member of the Council of the Observatory. It is understood that M. Bardoux suggested the adoption of the system in operation at the United States Naval Observatory at Washington, and to model the great Paris Observatory after that institution; and as stated above, the appointment of Admiral Mouchez as director, and M. Lœwy as sub-director, are at present intended to be limited to five years, with the same restriction as to future nominations.

M. Maurice Lœwy, who was born at Pesth in 1834, commenced his astronomical career at the Imperial Observatory of Vienna, under the late Prof. Carl von Littrow, on whose recommendation he was transferred to the Observatory of Paris by Leverrier, in 1860. At Vienna he was much occupied with the calculation of the orbits of comets, including the great comet of Donati in 1858, for which body he was one of the first to establish elliptical elements. He succeeded Laugier, as one of the astronomers of the Bureau des Longitudes in 1872, and since 1874 has been charged with the preparation of the *Connaissance des Temps*, the French national ephemeris, and the *Annuaire*, works which have greatly benefited by his energetic superintendence. Under Delaunay's rule, M. Lœwy occupied the position of sub-director of the Observatory of Paris, charging himself with the meridian observations.

The installation of Admiral Mouchez took place on Saturday by the Council of the Observatory, of which M. Dumas is president.

#### PROF. W. M. GABB

WE greatly regret to hear of the death from consumption, on May 30, at his residence in Philadelphia, of Prof. William M. Gabb, who for many years has occupied a very prominent place among American naturalists.

He was born on January 20, 1839, in Philadelphia, and was educated at its High School, being one of the many graduates of whom that institution had reason to be proud. As a boy he was especially interested in mineralogy and palæontology, and at an early age was so fortunate as to secure an engagement with Prof. James Hall, where he had ample opportunity of indulging his tastes. Returning to Philadelphia, he became a member of the Academy of Natural Sciences, and soon commenced the critical study of the fossil invertebrates of the United States, especially those of the cretaceous formation.

In 1860 he entered the service of the Geological Survey of California, under Prof. J. D. Whitney, but returned to the East in 1868, and undertook the geological survey of their lands for the Santo Domingo Land and Mining Company, which, however, was made to cover a considerable portion of the Dominican Republic, and to which he subsequently made several successive visits for the purpose of continuing his work.

During his connection with the Geological Survey of California he made an extended exploration of the peninsula of Lower California, collecting much important geological and biological material.

In 1873 he became connected with the Costa Rican Government, undertaking a general geological and topographical survey of its territory, and combined with it very extensive researches into its natural history and ethnology, sending his collections to the National Museum in Washington. This labour occupied him for about three years. The results of his work have been given to the public in various forms. A full account of the topography, with an elaborate map, appeared in Petermann's *Mittheilungen*, and a paper on the ethnology of the native tribes, published by the American Philosophical Society, is one of standard value.

In the autumn of 1876 he revisited San Domingo, returning to the United States in March last. For many years he has been threatened with pulmonary disease, the extension of which has been checked by his abode in sub-tropical regions. The unfavourable symptoms, however, increased of late, and he succumbed shortly after his return to Philadelphia.

Dr. Gabb left an extensive manuscript on the geology and palæontology of Costa Rica, which will be published ere long under competent supervision, thus closing a career of energy and activity, not only in the prosecution of researches, but in the elaboration of their results, which has been seldom equalled by a man of his age. It is very rare, indeed, that one man has accomplished so much in so many distinct branches—in geology, geography, palæontology, ethnology, &c.—as the subject of our present notice.

#### ON THE ANATOMY OF THE ORGAN OF HEARING IN RELATION TO THE DISCOVERY OF THE PRINCIPLE OF THE MICROPHONE OF PROF. D. E. HUGHES, AND THE MAGNAPHONE OF MR. W. L. SCOTT, A.S.T.E.<sup>1</sup>

THE two gentlemen whose names appear in the heading of this paper seem to have arrived at the same important result, viz., the extraordinary effect of mobile particles in transmitting sound under certain conditions, by quite independent research. In perusing the interesting accounts of the *microphone* in several scientific journals, but especially an article in the *Electrician* for May 25, in which number also will be found Mr. Scott's statement of the principle, it occurred to me that the transmitting power of the *otoconia* and *otoliths* in the ears of animals bore very pertinently upon this question. We find *otoconia*, or numerous minute particles in all the *Vertebrata*, with perhaps the exception of the bony fishes which have single concretions, or the union of many in one. *Otoconia* are also found in the *Tetrabranchiate Cephalopoda* (*Nautilus*, Fig. 1), the whole of the *Pteropoda*, in the *Pulmonifera inoperculata*, or rather the bisexual *Pulmonifera* (snails and slugs, Fig. 3), there being an operculum in *Amphibola*. On the other hand, in the *Dibranchiate Cephalopoda* (*Sepia*, Fig. 2), all the *Heteropoda* (Fig. 5) and the *unisexual operculate Pulmonifera* (Fig. 4) the ear-sacs contain single *otoliths*.

It will be thus seen that the nature of the auditory concretions is by no means an unimportant element in the classification of animals.<sup>2</sup> Prof. Huxley alludes to the genus *Polyophthalmus*, an Annelidan with eyes in every segment, as a remarkable fact, but this is excelled by his notice of *otoliths* in the tail of *Mysis flexuosa*,<sup>3</sup> a little pelagic crustacean which I have often had the opportunity of examining.

Every physiologist is aware that there are structural particulars in the ears of *Vertebrata* which show clearly that nature's philosophy is of a more profound character than that to which man has hitherto attained. Indeed if we study the simplest ears in creation, those, for example, of the common *Snail* and of the *Periwinkle*, a most interesting problem is presented to us to solve, namely, the precise function of the numerous *otoconia* in one case, and of the single *otoliths* in the other. It is commonly granted that these concretions augment the sonorous undulations by resonance, a view which is borne out by several considerations. If we take two stones and strike them together under water, the head also being immersed, the collision will produce a very loud and peculiar sound, but in order to make the minute *otoconia* impress one another

<sup>1</sup> By John Denis Macdonald, M.D., F.R.S., Dep. Ins. Gen. R.N., &c.

<sup>2</sup> See a paper by the author in the *Linnean Transactions* for 1860, in which a classification of the Gasteropoda has been attempted.

<sup>3</sup> See *Ann. and Mag. of Nat. Hist.* for May, 1851.