THE CULTIVATION OF OYSTERS.

A REPORT from the British Consul at Baltimore on the oyster-fisheries of Maryland, which has just been laid before Parliament, contains much interesting information respecting the cultivation of oysters. The method of farming most successful in America consists in depositing clean oyster-shells upon the bottom, just before the spawning-season, to which the young attach themselves, and then placing among the shells a few mature oysters to furnish eggs and young. As soon as the young oysters caught in this manner are large enough to handle, they are distributed over the bottom. Another system is by artificial propagation, properly so called—that is, by producing the seed-oyster itself, or procuring it by methods less simple than the shell-sowing process. This method is due to a discovery by Dr. W. K. Brooks that the *Ostrea virginiana*, or American oyster, is not, like the *Ostrea edulis*, or oyster of Northern Europe, hermaphrodite, but is exclusively male or exclusively female. The eggs of the European oyster are fertilized within the valves of the parent, while in the case of the American oyster, fertilization takes place in the broad and open waters. By experiment Dr. Brooks discovered how artificial fertilization could be procured, and the next great step of finding a simple and practical method of rearing the young oysters which have been hatched artificially was the work of M. Bouchon Brandslé, the French naturalist, who experimented with Portuguese oysters, which, like the American variety, are of distinct sexes. He succeeded in rearing many seed-oysters fit for planting. Another highly important industry which is springing up in the United States, and which also owes its existence to a careful study of the habits of the bivalve, is that of "muzzling" oysters, by which they can be sent long distances in their shells with perfect safety. Until recently, the general practice was to pack the raw oysters in ice, but a sudden rise of temperature is liable to render a whole week's supply useless. Oysters feed twice a day; and always at the still moment preceding the turn of the tide, and at no other time, except when feeding, do they open their shells. When taken out of their natural element, they attempt to feed at regular intervals, and so soon as the shells open, the liquor they contain is all lost, the air takes its place, and the oyster is covered with a thick coating of slime, which is the first stage of decomposition. As long as the shells are closed, the oyster is fit to eat; it feeds on the liquor in the shell, and will thus keep in good condition for a considerable time. To secure the keeping of the shells closed, a method has been invented of tying them with stout wire, which can be done with great rapidity, and now arrangements are being made for despatching American oysters in their natural condition all over the civilized world.

SCIENTIFIC SERIALS.

The Quarterly Journal of Microscopical Science, February, 1888, contains:—On the Photospheria of *Nyctiphanes norvegica*, G. O. Sars, by Rupert Vallentin and J. T. Cunningham (Plate 23). The authors give an account of their examination of the luminous organs of this little crustacean; it is a distinctly northern form, being absent from the Mediterranean and the warmer parts of the Atlantic. It is abundant on the west coast of Norway; the adults seem to live on the bottom and never swim far from the ground, while the young, up to half or three-quarters the size of the adult, occur abundantly at the very surface, and at all intermediate depths. Mr. Murray found swarms in the Faroe Channel, and it seems common in the the Clyde sea-area; the authors took it in abundance off Brodick Bay. The histological details of the luminous organs are given in detail, and agree for the most part with those of G. C. Sars.—On the early stages of the development of a South American species of Peripatus, by W. L. Sclater (Plate 24). These details are worked out from a species found by Mr. Sclater in Demerara, and called by him *P. imthurni*; the early stages present great differences when compared with those described by M. Sedgwick in *P. capensis*.—On the anatomy of *Allurus tetraëdrus* (Eisen), by Frank E. Beddard (Plate 25). The specimen described came from Teneriffe; there are several structural differences between this genus and Allolobophora.—On the development of the Cape species of Peripatus; Part iv. the changes from the G stage to birth, by Adam Sedgwick, F.R.S. (Plates 26-29).—On the occurrence of numerous Nephridia in the same segment of certain earthworms, and on the relationship between the excretory system in the Annelida and in the Platyhelminths, by Frank E. Beddard (Plates 30 and 31).—On the anatomy of the Madreporia, iv., by Dr. G. Herbert Fowler (Plates 32 and 33). The author gives the result of his investigations of the species of seven more genera of the Madrepores, which, among other important results, seem to establish a relationship between the external body-wall and the corallum, which depending on the presence or absence of cœnenchyma may yield a distinctive morphological character. In all those genera in which a cœnenchyma is found, whether they belong to the Perforata or Imperforata, the body-wall rests on the little spikes or echinulations which stud the surface of the corallum. A new species of Seriatopora is described as *S. tenuicornis*; it was found by Dr. S. J. Hickson at the Celebes; it comes near *S. caliendrum*.

Transactions and Proceedings of the New Zealand Institute for 1886, vol. xix. (Wellington, May 1887).—The principal contents of this volume, edited as usual by Sir James Hector, are as follow:—*Zoology*: E. Meyrick, monograph of New Zealand Noctuina, describes sixty-three species.—W. M. Maskell, on the "honeydew" of Coccidæ, and the Fungus accompanying these insects; Further notes on New Zealand Coccidæ; On the freshwater Infusoria of the Wellington district. In the second paper a new genus and two new species are described; in the last many new species are described, and several well-known British forms are recorded; all these papers are illustrated.—G. V. Hudson, on New Zealand glow-worms.—T. W. Kirk, notes, double earth-worm; New species of Ixodes; *Zootoca vivipara*, in New Zealand; New species of Alpheus.—A. Purdie, *Pasiphila lichenodes* sp. nov., and descriptions of larvæ of three species of the genus.—A. T. Urquhart, on new species of Araneidea; On the work of earth-worms.—W. W. Smith, notes on New Zealand earth-worms, gives some very interesting details.—W. Colenso, deformed bill of a Huia; New species of Hemideina; Gestation of a species of Naultinus.—T. Jeffery Parker, on *Palinurus lalandii* and *P. edwardsii*, decides that there are constant though slight differences between the two species; *P. edwardsii*, Hutton, being the New Zealand form, the other being the Cape of Good Hope form.—C. W. Robson, new giant cuttle-fish (*Architeuthis kirkii*).—J. A. Newell, anatomy of *Patinella radians*.—T. F. Cheeseman, Mollusca of the vicinity of Auckland.—J. Adams, land Mollusca of the Thames gold-fields.—A. Reischek, Hauturu Island and its birds; Ornithological notes.—S. Weetman, Moa remains on the Great Barrier Island.—R. Haeusler, Foraminifera from Hauraki Gulf.—P. Goyen, descriptions of new spiders.—*Botany*: J. Buchanan, new native plants; *Hemitelia smithii*, a branching specimen.—T. F. Cheeseman, on the New Zealand species of Coprosma.—W. Colenso, on tree ferns; On some new Phænogamic plants; On some new Cryptogamic plants; Fungi recently discovered in New Zealand.—Catherine Alexander, on the glands in the stem and leaf of *Myoporum lætum*.—T. W. Rowe, on the development of the flower of *Coriaria ruscifolia*.—J. Baber, medicinal properties of some New Zealand plants.—D. Petrie, descriptions of new native plants.—*Geology*: J. Park, ascent of Ruapehu, the exact height was not apparently determined, "about 9000 feet high."—There is a series of important papers on the eruption of Tarawera Mountain and Rotomahana, by J. A. Pond and S. Percy Smith, Major Mair, L. Cussen, Archdeacon Williams, E. P. Dumerque, and H. Hill.—Prof. F. W. Hutton, on the geology of the Trelissick or Broken River Basin, Selwyn County; On the so-called gabbro of Dun Mountain; On the geology of the country between Oamaru and Moeraki; On the geology of the Valley of the Waihao in South Canterbury.—A. McKay, the Waihao greensands and their relation to the Ototara limestone.—Sir J. von Haast, notes on the age and subdivisions of the sedimentary rocks in the Canterbury Mountains, based upon the palæontological researches of Baron von Ettingshausen.—W. S. Hamilton, notes on the geology of the Bluff District.—J. Goodall, on the formation of Timaru Downs.

Reale Istituto Lombardo, March 8.—This number is mainly occupied with E. G. Celoria's determination of some new orbits of the double stars OΣ 298 in the constellation of Boötes and β Delphini. The results of thirty-nine distinct observations are tabulated, and compared with previous more or less approximate determinations of these orbits by Burnham, Dawes, Dembowski, Dunér, Engelmann, Asaph Hall, Perrotin, Schiaparelli, Seabroke, Struve, and Wilson.

Rivista Scientifico-Industriale, March 31.—Influence of magnetism on the electric resistance of solid conductors, by Dr. Faè. In this paper the author explains the conclusions already announced for cobalt and antimony, and describes his further researches on other bodies in connection with the influence of magnetism on their electric resistance. He concludes generally that the resistance of the principal solid conductors undergoes modifications in the magnetic field, such modifications being perceptible enough in the highly magnetic or diamagnetic metals, but most conspicuous in bismuth. In all other metals it is very slight, and at times quite inappreciable. Under like conditions the resistance in the direction of the lines of force increases both for the magnetic and diamagnetic metals, while in the direction normal to the lines of force it diminishes in the first and increases in the second, although under special conditions iron and steel behave exceptionally. These variations of resistance make it probable that Hall's phenomenon depends in effect on a transitory change produced by the magnetism in the structure of the metals, and causing a rotatory variation in the electric resistance.—Dr. Luigi Fritsch describes an industrial product of the nitrate of ethyl.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 2.—"On the Voltaic Circles producible by the mutual Neutralization of Acid and Alkaline Fluids, and on various related Forms of Electromotors." By C. R. Alder Wright, D.Sc., F.R.S., Lecturer on Chemistry and Physics, and C. Thompson, F.I.C., F.C.S., Demonstrator of Chemistry in St. Mary's Hospital Medical School.

About the beginning of the present century it was noticed that when platinum plates are immersed respectively in an acid and an alkaline fluid (*e.g.* diluted sulphuric acid and caustic potash solution), and connected with a galvanometer, a much stronger current flows at first than after passing awhile: which circumstance may be explained by supposing that in virtue of the chemical action taking place between the two fluids a current is generated, the flowing of which necessarily causes electrolysis of the liquids, so that the plates become "polarized" by the evolution thereon of hydrogen and oxygen respectively, whereby an inverse E.M.F. is set up, gas battery fashion. It was shown subsequently by Becquerel that when *nitric* acid is thus used in conjunction with caustic potash a much more powerful continuous current can be generated, the passage of which is accompanied by a continuous evolution of oxygen from the plate immersed in the alkali, whilst the nitric acid is simultaneously reduced, forming lower oxides of nitrogen: whence the term "pile à oxygène" applied to the combination. In this arrangement the hydrogen supposed to be formed electrolytically can never actually make its appearance in the free state, being oxidized whilst nascent by the nitric acid; so that as the gas battery inverse E.M.F. is not developed, the continuous current passing is not so much weakened; the oxygen set free by electrolysis consequently passes off continuously at the other plate.

It occurred to the authors that, if this reasoning be correct, firstly, other oxidizing acid liquids besides nitric acid should be able to act in the same way, causing continuous oxygen evolution at the plate immersed in the alkali. Secondly, by parity of reasoning, if ordinary dilute sulphuric acid be used on the one side opposed to an alkaline fluid also containing some readily oxidizable substance dissolved therein, continuous *hydrogen* evolution should, under favourable circumstances, be produced at the plate in the acid, the oxygen evolved at the other plate being acted upon while nascent by the oxidizable substance present, so as to be suppressed just as the hydrogen is in Becquerel's "pile à oxygène." Thirdly, whether oxygen or hydrogen be continuously evolved, the quantity liberated should be proportionate to the current passing; so that, if a silver voltameter be included in the circuit, for every milligramme-equivalent (108 mgrms.) of silver deposited 1 mgrm.-equivalent of gas should be liberated; *i.e.* 8 mgrms. of hydrogen occupying at 0° and 760 mm. 5·6 c.c.; or 1 mgrm. of hydrogen occupying 11·2 c.c.

A number of cells were arranged, consisting of two porcelain basins or beakers, one containing the acid and the other the alkaline fluid united by a siphon tube, or by a thick wick, containing or wetted with a strong solution of the salt formed by the union of the acid and alkali (*e.g.* sulphate of soda when sulphuric acid and caustic soda were used, and so on). A plate of platinum foil was placed in each fluid attached to a platinum wire, and arranged under an inverted graduated tube filled with the liquid pertaining to that side of the cell, so that any evolved gas could be collected and measured, loss of gas from evolution at the surface of the wire outside the tube being avoided by coating the wire with gutta percha or paraffin wax. A small silver voltameter with a gold plate as negative electrode was always included in the circuit, so as to permit of the deposited silver being determined. Numerous experiments thus made are described, the results of which were always in sensible accordance with the above previsions, a considerable variety of acid oxidizing fluids and alkaline oxidizable solutions being employed.

These results render it probable that, if, instead of a platinum plate and an oxidizable substance in solution, there be used simple caustic soda or ammonia, and an oxidizable metal, the oxide of which is soluble in the alkaline fluid, continuous currents might be set up (in certain cases at least), even though the metal used have of itself no visible action on the alkaline fluid, apart from its absorbing oxygen dissolved therein or in contact therewith; for instance, metallic tin or lead in contact with caustic soda, or copper immersed in ammonia solution. On trying such experiments, continuous evolution of hydrogen from the surface of the platinum plate immersed in the acid was found in many instances to be readily brought about, the amount evolved being (as might *a priori* be anticipated) proportionate to the current passing, *i.e.* to the quantity of silver deposited in a silver voltameter included in the circuit. By employing an alkaline solution of potassium cyanide, it was found easy to produce the same result when certain metals of the non-oxidizable class (gold, silver, palladium, and mercury, but *not* platinum) were used instead of really oxidizable ones.

In most cases the quantity of metal taken into solution in the alkaline fluid was practically identical with that equivalent to the current passing, calculated on the assumption that the nascent oxygen due to the electrolysis combined with the metal *to form the lowest oxide* thereof, in the various cases respectively. In some few instances a slight excess of metal was dissolved, obviously due either to local action or the effect of small quantities of dissolved air. Two well-marked exceptions to the general rule, however, were noticed: one was *tin*, which when dissolved in caustic soda invariably went into solution to an appreciably less extent than corresponded with SnO; instead of fifty-nine parts of tin being dissolved for every 108 of silver deposited in the volameter, only quantities amounting to 93 to 97 per cent. of that amount were dissolved, indicating that some little quantity of SnO_2 was formed as well as SnO, although the latter largely predominated. The other exception was *mercury*, which in contact with potassium cyanide dissolved to only half the extent due to formation of Hg_2O, *mercuric* potassio-cyanide being produced. Copper, whether in contact with ammonia or with potassium cyanide, on the other hand, always dissolved in proportions corresponding with Cu_2O, a little excess instead of deficiency being usually noticeable through the secondary action of dissolved air.

In all these experiments, the results obtained are precisely those due to electrolysis of the salt formed by the neutralization of the acid and alkali in accordance with the scheme (for sulphuric acid and soda)—

$$\begin{cases} H_2SO_4 \mid Na_2SO_4 \mid Na_2SO_4 \mid 2NaOH \\ H_2 \mid SO_4Na_2 \mid SO_4Na_2 \mid SO_4Na_2 \mid H_2O + O; \end{cases}$$

where either the hydrogen or the oxygen is suppressed, whilst nascent, by combination with the fluid in contact with which it is evolved, or with the metal in the case of oxygen in the cells last described.

Accordingly it might be expected that in all actions of this kind a quantity of acid on the one hand, and of alkali on the other, proportionate to the current passing, will disappear as such on account of the mutual neutralization thus indirectly brought about. The authors have made a number of titration experiments with a view to obtaining numerical evidence on this point, with the general result of finding that such neutralization always takes place. It may be noticed that if cells be constructed with platinum electrodes immersed respectively in an alkaline fluid containing an oxidizable substance dissolved therein, and an acid fluid containing an oxidizing agent (*e.g.* caustic soda solution of pyrogallol, and sulphuric acid solution of chromic anhydride), continuous currents of very considerable power may be obtained when the internal resistance is diminished sufficiently by using cells of considerable magnitude; *e.g.* when made of