

skill and strength of his guide, Mattias Zurbriggen, and by his own readiness of resource. The accident was caused by the wholly unexpected fall of a great block of stone. Notwithstanding all difficulties, Mr. FitzGerald made the ascent of four peaks hitherto unclimbed—Mount Tasman (11,475 feet), Mount Sefton (10,350 feet), Mount Haidinger (10,054 feet), and Mount Sealy (8,631 feet), and crossed three new glacier passes. One of these, though it hardly deserves the name of a glacier pass, is a discovery of importance to the colony. Till this time the great mountain wall had prevented any communication between the eastern and western coasts except by sea, so that a direct route across this barrier anywhere near the middle of the island was much desired. Mr. FitzGerald discovered a pass, which now bears his name, leading direct from one of the branches of the Tasman valley to the west coast. There is a very small glacier on the east side, and none at all on the other. It is, as he says, a pass comparable with the Monte Moro in Switzerland, and so, with some expenditure on making the track, may be easily crossed by packhorses and cattle, at any rate during the summer season. His own experience was the reverse of agreeable. Preliminary explorations with Zurbriggen showed them that the eastern side presented no difficulty, and suggested that the descent on the western would be easy. So it was for a while; then they found themselves confronted with an impenetrable "scrub" at a place where the river entered a gorge. After attempting the former, they were forced to follow the latter as the less evil way. But the result was that, instead of reaching the west coast in about twenty-four hours from the starting-point, they were out for two nights and nearly three days, having taken provisions for one day only! This difficulty of course will not recur, for a road can be easily cut through the scrub. The book is well written and illustrated, though perhaps one or two of the pictures—not made from sketches taken on the spot—are slightly sensational. Some appendices contain details of interest as to geology and natural history. It tells unaffectedly and most attractively a tale of careful preparation, bold climbing, and wonderful endurance.

Mr. Weston, while British chaplain at Kobe, spent his holidays for four years in wandering about the mountain regions of Central Japan. Of course he was often far away from beaten tracks, and saw much of the native life in its original simplicity. His experiences are described in the brightly and pleasantly written volume before us, which also contains some curious information as to the customs and the religious beliefs of the people, demonology, the "possession" of human beings by animals, ghosts, rites of incantation, such as those for affecting the weather, and the like. He seems to have found no special difficulties in travel, and generally met with a kindly reception from this quaint and courteous people, except once or twice when impediments were caused in regard to passports, or from a belief like that which formerly kept the Swiss away from Pilatus; but he had often to rough it, for the accommodation frequently is very primitive, and food is scanty. But there is one set-off in Japanese travel, that the "honourable hot-bath," as it is politely called, is a general institution. As, however, this serves many bathers without change of the water, it is well to secure an early turn.

The backbone of the Japanese Alps consists of granitic rocks with crystalline schists, through which igneous masses have been extruded. Thus some peaks are of granite, others are of felstone or old volcanic rocks, others are cones which still retain their craters. Hence the rocks are of very different ages, and some of the older exhibit marked indications of mechanical disturbances. The higher summits seem very commonly just to overtop 10,000 feet. Thus Hodakadake, the highest granitic peak in Japan, is 10,150 feet; Yurigatake, the boldest in out-

line and a "brecciated porphyry," is 10,300 feet; while Fuji-san, which exceeds all the rest by 2000 feet, being 12,400 feet, is a crater. This indicates considerable difference in age, and the chain very probably is of a complex character. Mr. Gowland, who contributes a few remarks on the geology, thinks its beginning was in Paleozoic times, when it consisted chiefly of granite and schists. All the above-named peaks and sundry others were ascended by Mr. Weston, who also crossed several passes. These generally range from about 5000 to rather more than 7000 feet. In fine weather the climbing does not seem to present many serious difficulties, but the great rock slabs are apt to be slippery in wet, and the distances traversed on foot are sometimes rather great. His verdict is that while these mountains do not display the glory of glacier-shrouded peaks, and are on a scale only two-thirds of the Alps of Switzerland, they surpass anything he has met with among the latter in "the picturesqueness of their valleys and the magnificence of the dark and silent forests that clothe their massive flanks." The larger illustrations show that this praise is not exaggerated; two of the most striking represent the granitic pinnacles of Hodakadake and the singular cone of Fuji-san capped by a "bonnet cloud." For the use of the latter illustration (Fig. 3) we are indebted to the publishers. The smaller cuts also, which represent a variety of subjects, and are in several cases excellent, add to the value of this attractive work.

T. G. BONNEY.

OYSTER CULTURE IN RELATION TO DISEASE.

UNDER the above title the Medical Officer of the Local Government Board has just issued a supplement to his report for 1894-95, dealing with reports and papers on the cultivation and storage of oysters and certain other edible molluscs in relation to the occurrence of disease in man. An inquiry on this subject was bound to be instituted sooner or later. There has been an uneasy feeling for many years past that the infection of enteric or typhoid fever is at times due to the consumption of uncooked oysters; and in his report on cholera in England in 1893, Dr. Thorne Thorne expressed his conviction that the distribution of shell-fish from Cleethorpes and Grimsby, as a centre, had been concerned in the diffusion of scattered cases of cholera over a somewhat wide area of England, owing to the fact that oysters and other molluscs at these ports were so deposited and stored as to be almost necessarily bathed each tide with the effluent of sewers at that time receiving cholera discharges. In the early part of 1895, Sir William Broadbent also publicly announced his conviction that oysters were occasionally capable of transmitting the infection of typhoid fever, and the fact received startling confirmation from a report to the State Board of Health of Connecticut, U.S.A., by Prof. Conn, on an oyster epidemic of typhoid at Wesleyan University, Middletown, Connecticut, in which some twenty-six cases of that disease were indisputably traced to the consumption of raw oysters, which had the opportunity of becoming specifically contaminated by sewage delivered at the time the discharges of typhoid patients. A similar outbreak of Saint-André de Sangoins, in the Mediterranean Department of Herault, was investigated by Dr. Chante-messe, and traced to oysters received from Cette, on the coast of the same Department, where, according to a Commission subsequently appointed, the oysters had been stored in waters highly contaminated with sewage.

Under these circumstances, the Local Government Board determined to institute a searching inquiry into the conditions of oyster cultivation and storage along the coasts of England and Wales, and to cause bacteriological investigations to be made as to the power of the

oyster to absorb, retain, and transmit the typhoid bacillus and the cholera vibrio. The first part of the inquiry was entrusted to Dr. Timbrell Bulstrode, and the second portion to Dr. Klein. Their reports, which are suitably illustrated with photographs and maps, constitute the material on which Dr. Thorne Thorne bases his introductory remarks. In the appendix are given a copy of Prof. Conn's report already alluded to, and an extract from the *Proceedings* of the Académie de Médecine in Paris, relating to the spread of disease through the agency of oysters.

The value and extent of the oyster trade in this country may be gleaned from the following figures, furnished by Dr. Bulstrode. In 1894 there were landed on the English and Welsh coasts, by English dredgers, 27,747,000 oysters, valued at £84,271, the average price being per 100, 6s. 1d., and per 1000, £3 os. 10d. These were delivered on the several coasts as follows:—

| | Oysters. | ... | Value. |
|-----------------|-------------------|-----|---------------|
| East Coast ... | 16,833,000 | ... | £58,300 |
| South Coast ... | 4,251,000 | ... | 11,186 |
| West Coast ... | 6,663,000 | ... | 14,785 |
| | <u>27,747,000</u> | ... | <u>84,271</u> |

These figures relate only to oysters landed by English boats employed in the home industry; in addition enormous quantities are imported from abroad, partly for relaying, and partly for more or less immediate consumption. American oysters, known as "Blue points," "East rivers," and "Sounds" are mainly received at Liverpool and Southampton, whilst the Dutch and Belgian oysters chiefly come to Grimsby and Brightlingsea. A considerable number also are received from Scotch and Irish beds.

It is generally assumed, at all events, by the more educated lovers of the bivalve, that oysters are "out of season" during such months as have not the letter "r" in their names, and as a matter of fact the "close time" for oysters, born and bred in this country, extends from May 14 to August 4—that is during the spatting season. But that portion of the community which is referred to in the report as "the less fastidious class," and which is "addicted to the practice of sea-side trips of brief duration," is addicted also to the practice of eating the oyster at any time of the year it can be got, and in the summer months, therefore, has to content itself with the imported varieties, the restriction as to "close time" not applying to oysters taken in the waters of a foreign State.

It would appear from the returns that the largest number of oysters is consumed in September; but, although the number eaten diminishes as the year draws to a close, their value steadily increases up to December, when it gradually diminishes, month after month, until it reaches a minimum in June or July.

As the result of Dr. Bulstrode's inquiries and observations, it is distinctly disquieting to be told that only a few of the oyster layings, fattening beds, or storage ponds round the English and Welsh coasts can be regarded as theoretically free from every possible chance of sewage pollution. At the same time, in the case of the majority of them, the polluting matter is mixed with so vast a bulk of water that there is little substantial risk of deleterious influence. The possible mischief is due to the circumstance that the cultivation of the oyster is mainly carried on at points on the coast which are readily accessible, and where labour can be easily obtained, or, in other words, in tidal estuaries in the neighbourhood of more or less populous places, into which, therefore, the sewage of such places is apt to be delivered. In the report, three such localities are singled out for special condemnation; viz. Southend, where, as regards one laying, "the sea-bottom and the matters floating on the surface, afford the most obvious proof that the conditions are filthy in the extreme"; at Cleethorpes, where the

layings are exposed to the influence of sewer outfalls, serving (counting that of Grimsby) populations of about 67,000; and the Medina, in the Isle of Wight, of which it is stated that "it seems almost beyond comprehension how any one could venture to 'fatten' oysters for human consumption in a river estuary such as this, which is fouled above the layings by the crude sewage of Newport, with its 10,000 inhabitants, by the effluent from the neighbouring prison and barracks, and by the overflow from the workhouse cesspool; and which receives into it immediately below the layings the contents of eight other sewer and drain outfalls from East Cowes and West Cowes." It is further pointed out that "the layings in the Penryn River, Cornwall, and those in Brightlingsea Creek, in Essex, also call for especial notice in connection with the obvious risk of sewage pollution. At Brightlingsea this risk has more than once been drawn attention to by the local health officer. The layings in the South Channel, off Southwick, near Shoreham, are similarly exposed to sewage; and in a minor degree, on account of the great bulk of water there in question, such layings as those in the Menai Straits come under suspicion. From most, if not all, of these layings, oysters are despatched direct to market."

On the other hand, some of the most celebrated layings on the coast of Essex and Kent—as in the Crouch, Roach and Blackwater, and off the Swale—are practically free from risk, although the layings in the bed of the Colne which presumably furnish the supplies for the time-honoured "Colchester feast," are subjected to the comparatively concentrated effluent of Colchester sewage at low water, and to the additional pollution to which the river is subjected at Wivenhoe and Rowhedge.

The conditions under which the oysters are stored in beds, ponds, or pits, pending despatch to market, naturally received close attention. The layings or "fattening" places might be everything that could be desired, but the oysters, when lifted, might still be stored in a most objectionable manner. The boxes off Southend Pier, for example, float in what is practically dilute sewage. A set of storage pits at the mouth of the Blackwater was found to be within forty-three yards of the point at which the drainage of twenty houses is discharged. At Wivenhoe "it is impossible to see how the oysters there stored in pits can escape contamination by sewage." The means for the storage of oysters in the Fish Dock at Grimsby, are stated to be particularly offensive and dangerous. "It would be difficult to find much worse conditions than those under which certain storage pits are placed at Poole." . . . "At Warsash, above the junction of the Hamble River with Southampton Water, a sewer was found opening out just between two oyster ponds. Again at Emsworth, near Havant, a sewer and certain drain outfalls have been conveyed into the middle of a group of oyster pits, and matters are little better at Bosham."

On the other hand, the methods of storage on the Crouch and Roach, and for the most part also of the Blackwater, leave little to be desired, and the same may be said of the layings and means of storage in the Helford River in Cornwall, and at Newtown Estuary in the Isle of Wight.

To judge, however, from the frequency of instances to the contrary, it would almost seem that the cultivators were under the belief that the oyster actually enjoys himself and waxes fat in insanitary surroundings. Precisely the opposite is the case. No one enjoys the confidence of the oyster to a greater extent than Prof. Herdman, or is better able to appreciate his innermost sentiments; and we gather from Prof. Herdman's recent work that the oyster—especially the British-born-and-bred oyster—is, in reality, a cleanly, self-respecting mollusc, with an appetite not less dainty or fastidious than that of the epicure for whose gustatory pleasure he

is supposed to live. Indeed, if oysters in general had only the locomotive powers of their brethren in the classical legend of the Walrus and the Carpenter, there is very little doubt that, in many cases, they would quickly move off in search of quarters more salubrious than those in which they are often compelled to exist.

It is not easy to indicate how the present condition of things may best be remedied. Oysters, of course, are not a necessity, unless to the hardly-driven brain worker, to persons of feeble digestion, or to convalescents. Unless something is done, therefore, to reassure the public mind—either by the collective action of the oyster breeders themselves, or by systematic inspection on the part of the State—the future of the industry will be seriously jeopardised. As it is, the “scare” has done very great damage to the trade, and the good and the bad alike have indiscriminately suffered. To the statesman who is concerned with the welfare of a littoral population from which the *personnel* of our navy and coast defences is largely recruited, the problem has even a wider and deeper significance. On every ground, therefore, the question calls for prompt remedial action.

At the conclusion of his report Dr. Bulstrode makes some reference to “green-bearded” or “green-finned” oysters. These oysters find but little favour in this country, although, as is well-known, they are much appreciated in France, and the “huîtres vertes” or “huîtres de Marennes” obtain a far higher price in the Paris market than the “huîtres blanches.” This green colour, which is met with to a small extent in certain Essex oysters, has been the subject of repeated investigation during the last seventy years, notably by Gaillon (1820), Valenciennes (1841), and Puségur and Decaisne (1877). The last-named observers found that the green tint was due to the inclusion of a diatom—*Navicula ostrearia*, or, as it is now called, *N. fusiformis*, taken up from the “claires” in which the oysters are confined. These observations were confirmed and extended, in 1885, by Prof. Ray Lankester, who showed that a blue pigment, which he termed “Marennin” occurs in the *Navicula*, and is either “uniformly diffused throughout the cell protoplasm,” or “confined to the ends of the elongated cell body” (Bulstrode). In the oyster the green colouring matter is localised on the surface of the gills and labial palps in “certain peculiar cells of the superficial epithelium.” It is the deposition of this blue pigment (Marennin) in the yellowish brown gills which, according to Prof. Lankester, gives rise to the green appearance of the “huîtres de Marennes.”

It has been often alleged that this greenness is due to copper, and as a matter of fact copper has frequently been detected in oysters since Bizio, in 1835, first discovered it in the organic substance of the mollusc. Dr. Bulstrode, from time to time, sent the writer of this notice oysters from different localities, and copper was uniformly found in them, although in the Marennes oysters it was present in minute amount only—far less, indeed, than in certain oysters of a normal colour. But there is no question that the greenness of certain oysters, especially of those found in Falmouth and Truro waters, is due to copper. The colour, both in character and distribution, is, however, quite different from that of the Marennes oyster. The green Cornish oyster is unsaleable in this country—at least for immediate consumption—as it leaves a distinct metallic taste in the mouth, similar, it is said, to that due to “sucking a penny.” Dr. Bulstrode caused a number of such oysters to be sent to me at different times. On incineration under conditions which precluded the possibility of the introduction of copper, there was no difficulty in detecting the presence of that metal in the ash. Indeed, here and there in the ash were particles of Alexandrine

or Egyptian blue, which, as Davy found long ago, is a *frit*, made by heating together soda, lime, sand, and copper. The amount of copper, on the average, was not more than about 0.02 grain per oyster, but as it is obviously caused by the mechanical retention of cupriferous particles, individual oysters might, and indeed did, contain large quantities. On examining the mud of the locality in which such green oysters occur, it was found to contain 0.148 per cent. of copper. On relaying, the green Cornish oyster gradually loses its colour, and also its metallic taste; specimens of such relaid oysters were found to contain only 0.0060 grains of copper per oyster, which is practically the same (*viz.* 0.062 grain), as that found in Whitstable oysters which had never been green. This amount would seem, therefore, to be normal to the oyster, and to be probably due to the presence of hæmocyannin, first found by Fredericq in the blood of the octopus, and since shown to be present also in many mollusca.

T. E. THORPE.

NOTES.

FOR the last three or four years we have been treated, in the copy of the *Times* appearing after the Anniversary Meeting of the Royal Society, to strictures of the action of the Council of that body. We have not thought it necessary to reply to these at length, because their origin was pretty well known, and the Royal Society is quite capable of taking care of itself. But this year we think the bounds of journalistic decorum have been passed in a leading article in which the regretted retirement of Lord Rayleigh from the Secretaryship is referred to. The *Times* states: “He has taken, . . . the unusual step of declining to sit on the Council, and no one who knows the play of forces within the Society can doubt that his refusal is significant.” This sentence is obviously intended to suggest that Lord Rayleigh’s resignation of the position which he has so long adorned, and in which his services have been so greatly valued, is due to a want of sympathy with his colleagues or to a want of respect for them. Lord Rayleigh is absent from England, but we believe that we know enough of the Royal Society and of Lord Rayleigh to warrant us in repelling at once, and, in his absence, the insinuation as unfounded, and as quite unworthy of the journal in which it has been allowed to appear.

AT the Royal Society’s meeting, last week, the following were elected Foreign Members of the Society:—Prof. Albert Heim, of Zürich, geologist; Prof. Gabriel Lippmann, of Paris, physicist; Prof. Gösta Mittag-Leffler, of Stockholm, mathematician; and Prof. Giovanni Schiaparelli, Director of the Royal Astronomical Observatory of Brera, Milan.

WE announced some time ago the lamentable death of M. Tisserand, the distinguished Director of the Paris Observatory. The French Government, according to the invariable rule, at once applied to the Academy of Sciences, to nominate two men whom they considered qualified to succeed him. They selected M. Loewy and M. Callandreau, the first place being given to M. Loewy, a fully-trained astronomer, who has made his reputation along many lines of research, and who has for many years belonged to the staff of the Observatory. We learn that the Government has accepted this nomination, and that M. Loewy has been appointed Director in succession to M. Tisserand.

LORD RAYLEIGH and Prof. Ramsay have been elected Corresponding Members of the Berlin Academy of Sciences.