into activity; and during the day volumes of smoke were distinctly seen, and columns of flame at night. Usually, at that season, Augustin and the peak are covered with deep snow. On the 10th of November, however, when Capt. Cullie approached the island, while there was a depth of four feet of snow at Port Graham (English Harbor), Mount St. Augustin was bare and black.

During this same season, a party of seven or eight Aleuts had established themselves on Chernaboura (Augustin) Island to hunt the otter during the winter. Two of the women refused to remain on account of the violent noises inside Mount St. Augustin; and they were taken to St. Paul, Kadiak. Since the eruption no one of this party has been seen, nor any signs of their bidarkas, although a rescuing party of natives had gone along the coast to learn of their whereabouts. It is feared, therefore, that they have been destroyed. In confirmation of this report of the native women, Capt. Sands says that he and others noticed that St. Augustin was emitting smoke as far back as August; but no other signs were observed before the heavy report of Oct. 6.

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THE COD-HATCHING EXPERIMENTS AT GLOUCESTER BY THE FISH COMMISSION.

IN the winter of 1878 and 1879 the Fish-commission at that time having a station at Gloucester, Mass., made very extensive experiments upon the hatching of certain salt-water fish, but more especially of the cod (Gadus morrhua). For years the cod has been almost entirely confined to the deeper waters on the coast, having been driven there by many causes, sewerage being the most probable and potent; and it has been since the discovery of America that these fish, at that time extremely abundant everywhere along the shore, even to such an extent that they could be caught in great numbers from any point of rocks, have become reduced in numbers to their present comparative scarceness, and at the same time driven from their former haunts to the deeper waters. Taking into account this remarkable decrease in numbers, and change of habitat, Professor Baird conceived the idea that the former abundance of cod could in part be restored by means of artificial propagation, which had proved so successful with the fresh-water species of fish. Many difficulties stood in the way, — difficulties which had never been encountered in any previous experiments. The principal trouble which was experienced resulted from the floating of the eggs, and it was only after many trials and numerous failures that an apparatus was invented which in part prevented the eggs from clogging the screen placed over the overflow-pipe.

The location for the primary experiments was fixed at Gloucester, on account of the great industry of catching and preparing these fish, which is centred there. Vessels and boats arrive every day during the winter months, bringing in fresh cod, many of them containing spawn. By the request of the commissioner, such fish were kept alive until they could be put into the live-box at the hatchery. It was also possible, and this was the most important reason for the choice, to carry on important investigations into the natural history of the deep-sea food-fishes, and to gather valuable statistics concerning the fisheries; it being impossible to get such information in any other place.

Many obstacles arose, owing to the location. A temperature of 30° F. is fatal to cod; and, as the surface-water in the harbor is liable to reach this point at any time during two or three months of the winter, it was necessary that the car containing the live fish from which spawn was to be taken should be constantly watched, and sunk to the bottom during every cold snap. The filthiness of the water caused by decaying waste portions of fish thrown into the docks — these being common receptacles for all dirt and refuse formed by the dressing-process — was such, that, even after the most careful filtering, the water was in a decidedly impure condition. The north-east storms so prevalent on the Massachusetts coast, especially during winter, kept the water in a roiled condition for a greater part of the time; so that when it reached the aquaria, although a great part of the mud had been filtered out, still the mudiness was apparent. Such a condition could not be other than an unhealthy one for young fish whose parents had been accustomed to the clear, cool, outer waters. When there were no storms, the great rise and fall of tide, about eleven feet, sufficed to keep the finer mud in constant circulation. But, notwithstanding these numerous obstacles, over one million and a half young cod were successfully hatched, and placed in the clearer waters of the outer harbor at Gloucester. On account of the impurity of the water even there, and the adverse conditions under which they were hatched, it was scarcely expected that any

practical increase in the number of cod would be noticed as the result of these experiments. However, the results obtained proved conclusively, that if carried on under favorable circumstances, and with the experience gained at Gloucester, hatching deep-sea fish could be successfully engaged in, and made a great success. It was with this belief that an appropriation was obtained from Congress for building the extensive hatching houses and basins which are in progress of erection at Wood's Holl, Mass. Here the harbor is very pure, there being no city emptying its refuse into the immediate waters. The bottom is composed of clean sand; while the water is pure and not too cold, receiving an offshoot of the Gulf Stream, instead of the Labrador current, as is the case at Gloucester. Here the tides, although forming swift currents by the pouring of immense quantities of water through narrow outlets, rise but two feet, which is a decided advantage. Within forty miles of the hatchery, fish can be caught in sufficient abundance to supply the wants of the commission; and it is to be expected that results of great importance will be obtained by hatching and placing young food-fish in the water at various points along the New-England coast.

For at least a year, reports have been prevalent to the effect that small cod belonging to the deep-sea species have been, and are at present, very abundant in the harbor at Gloucester. In order to find out definitely, Professor Baird asked me to inquire, and collect specimens if possible, while I was at Gloucester, in October. I ascertained, that, since the winter of 1882, 'silver-gray cod' (G. morrhua) have been caught in abundance, and of just the size that the artificially hatched fish would naturally be at this time. Not only are cod obtained in the outer harbor by the fishermen, but even in the impure waters of the extreme inner harbor, where they are frequently caught by boys fishing for flounders. A specimen taken in this manner was found by Capt. Collins in the taxidermist's store, and forwarded to Professor Baird. It proved to be the true deep-sea cod. One fisherman, while obtaining bait for his lobster-pots, during the early spring of 1883, frequently caught as many as a hundred pounds of these fish in a single catch. This same fisherman informed me that at least three or four generations were plainly distinguished, the smaller being much more abundant. From only one other point along the coast was I able to find this species of cod reported in the shallow water. A school was encountered by a Gloucester vessel close in by Mount Desert, and fourteen barrels obtained. They all measured within an inch or two of fourteen inches, — just the size of those reported from Gloucester, and exactly as long as the specimen obtained from that locality. I obtained two specimens from the Mount Desert school, which are at present in the National museum. Here we find, in a limited area, great numbers of a fish now inhabiting only the deeper waters; this fish for many years having been a total stranger to the locality in which it is at present so abundant, and not found, so far as is known after many inquiries, in other similar places, with but a single exception. The oldest and most observing fishermen never remember a similar instance; and all come to the conclusion, that they are the result of the hatching operations in 1879, those from Mount Desert being but a small portion of the larger school migrating from their given home. Certainly other than natural causes must be looked for to explain this sudden increase in a small, unfavorable locality: so, as a very convenient and satisfactory explanation is found, with evidence to back it, we will say with the fishermen, 'These must be Fish-commission cod.' They will of course migrate in time; for it is hardly to be expected that they will return to their first home after once finding purer water outside.

Undoubted good must come of the future operations, for millions and millions of eggs which would otherwise be spoiled will be hatched; the young reared, and placed in the water to live and reproduce; and thus the waters will become restocked with a species of fish which is growing scarcer every year with frightful rapidity. These unexpected results of the experiments prove beyond a doubt that even deep-sea fish can be kept under control by the same means that the stock of river-fish is regulated.

While at Gloucester, Professor Farlow, by request of Professor Baird, investigated the nature of the so-called 'reddening' of salted cod, which caused such ravages during the warm months, with the idea of furnishing a remedy. This peculiar 'reddening' was found to be caused by an alga (Clathrocystis roseo-persicina) which was abundant on the marshes near Gloucester. In many of the fish-houses the alga was present in large quantities on the walls, on the flakes, and even in the vessels, probably having been introduced there by the fishermen on their clothes, or from the mud on their boots. Furthermore, it existed to a considerable extent in the Cadiz salt, which was used in preference to Trepani

salt on account of the cheapness of the former. Trepani was, on the contrary, found to contain very little. Dr. Farlow advocated that the walls and all the wood-work be scraped, and washed in hot water to kill the plant, and that painted wood be used in preference to the rough natural walls in order to afford as little room as possible for the Clathrocystis to lodge itself. He further advised that Trepani salt be used instead of Cadiz. A number of fish-dealers have adopted his suggestion in regard to the salt, and they all inform me that for two summers not a single fish has been lost by 'reddening.' The wood-work contained the plant; and in warm weather old butts turned red on the outside, while the new ones, in which no pickle made from Cadiz salt had been kept, remained perfectly intact. The fish saved by this means more than paid for the difference in price between the two salts. Trepani salt seems to prevent the rapid growth of the plant, while Cadiz rather favors it. Here, as in many other cases, we see that a little scientific thought will accomplish that which would never be brought about without it.

RALPH S. TARR.

MUSEUMS OF NATURAL HISTORY IN THE UNITED STATES.[1]

THE state of its public museums, laboratories, and other scientific institutions, gives a very reliable measure of the appreciation and culture of science by a nation. We are often inclined to consider America as a country where money-making suppresses all other interests, where learning, art, poetry, — in one word, all the finer manifestations of the human mind, — can enjoy even a poor existence only in a few places, and find in general very unfavorable ground. One, however, who has had an opportunity of carefully observing American literature during recent years, could certainly not help seeing its intellectual activity; most of all, perhaps, in the case of the sciences, they being intimately connected with practical life, and among these especially those of geology and paleontology. Most of the states created geological surveys for the investigation of the country, and the publication of maps and other results: the general government extended these investigations to the territories. The elegant publications of these geographical and geological institutions, distributed with the greatest liberality, form already a library which contains information of the greatest value concerning the vast country of the United States.

We have often enough heard that they were founding public museums in America, and that, together with their indigenous treasures, they were desirous of obtaining the material of the old world for comparison, if, as now and then happened, a valuable private collection had to make its way across the ocean. It would form a long 'list of the missing,' should we enumerate all the valuable scientific objects, which, during the last thirty years, have gone to America from Germany alone. The contributions of England and France towards the enrichment of the transatlantic museums are, of course, not less. But, in spite of all this, the American museums are hardly known among us. While among the eminent learned men of America there are only a very few who have not travelled in Europe at least once, the new world is usually not studied with the same care by the learned men of the mother-countries. The Americans, however, have begun to make their treasures in natural science accessible to the public, as well as to the specialist, in a way which in many respects deserves admiration and imitation.

The following observations on some of the most prominent museums of natural history, made during a short stay in North America, will undoubtedly prove to be incomplete, one-sided, and perhaps in many respects even inaccurate. Their main object is merely to call the attention to those institutions more carefully than has hitherto been done.

Up to the middle of this century, Philadelphia was at the head of scientific investigation in America; and even to-day, when the principal city of Pennsylvania has almost lost its leading position, a visit at the fine museum of natural history will show everywhere the traces of a celebrated past, and of a comparatively old civilization. Among all the larger museums of North America, the museum of Philadelphia shows the strongest European influence in its whole organization, and in the arrangement of the collections. The handsome building belonging to the Academy of natural sciences is in the centre of the city, near one of those beautiful squares full of trees which are the pride of Philadelphia. The first floor contains a rich library, the meeting-rooms of the academy, rooms for officials and for special investigators. The collections are in the upper part of the building, in one large hall surrounded by wide galleries. Stuffed mammals, skeletons, and several large fossil vertebrates occupy the centre of the vast room. Among them a fossil gigantic saurian, with its strong hind-legs and short fore-legs, is conspicuous by its enormous size. The bones which were found at the 'Hopkins' farm in New Jersey, and which furnished the material for the restored skeleton of the Hadrosaurus, have been well prepared, and are now kept in show-cases near by, together with the remnants of another gigantic fossil lacertian (Laelaps), and together with the nearly complete skeleton of an Elasmosaurus, found in the chalk of Kansas, which has much resemblance to Plesiosaurus. The restoration of the Hadrosaurus was made before the time of Marsh's great discoveries, and before the twenty-four skeletons of Iguanodons had been found near Bernissart in Belgium. We must therefore not too severely criticise a few errors made by the restorer in the restoration of the missing parts. By the purchase of the collection of birds from the famous

[1] By Prof. K. A. ZITTEL of the University of Munich. Translated from the supplement to the *Allgemeine zeitung* of Dec. 16.