At half-past three o'clock. Vice-President Barnard, before the Section of Mathematics and Astronomy: 'Development of Astronomical Photography;' Vice-President Blue, before the Section of Social and Economic Science: 'The Historic Method in Economics;' Vice-President Packard, before the Section of Zoology: 'A Half-century of Evolution, with Special Reference to the Effects of Geological Changes on Animal Life.'

At half-past four o'clock. Vice-President Smith, before the Section of Chemistry: subject to be announced; Vice-President Fairchild, before the Section of Geology and Geography: 'Glacial Geology in America;' Vice-President Cooley, before the Section of Mechanical Science and Engineering: subject to be announced.

On Monday evening Professor Wolcott Gibbs will make the address of the retiring President, his subject being 'On Some Points in Theoretical Chemistry.' President Eliot will address the Association at Harvard University on Friday evening, and it is expected that illustrated lectures will be given on Wednesday evening on the Boston Park System and the Metropolitan Water Supply and Sewage System.

The scientific work of the sections will be practically confined to two days, Tuesday and Thursday, excursions having been arranged for Wednesday, Friday and Saturday. As we have already stated, the excursion on Wednesday will be to Salem, where the Association will be the guest of the Essex Institute, while on Friday it will be the guest of Harvard University by invitation of the President and Fellows. On Saturday excursions have been arranged to Riverside, Wellesley, Concord and Lexington; various excursions have also been planned to follow the close of the meeting.

THE BREEDING OF ANIMALS AT WOODS HOLL DURING THE MONTH OF MAY, 1898.

The opening of the Biological Laboratory of the United States Fish Commission made it possible for a number of naturalists to work at Woods Holl during the month of May, and it is hoped that the abundance of animal life may attract others to the shore in 1899.

The temperature of the water during the month of May rapidly rose from 46 to 57 F. To this remarkable physical change both the fauna and flora responded, and the biological facies were materially altered.

Vertebrates.—The winter forms gradually disappeared and the familiar types of the warmer months began to arrive. The lampreys (*Petromyzon marinus*), ripe with eggs, were taken during the latter part of the month at East Taunton. Spiny dogfish (*Squalus acanthias*) were taken in Vineyard Sound, and *Raja ocellata* was abundant throughout the month, though probably not breeding. The transparent young of the common eel were frequently taken on the surface and in the shallow water. The fishermen say that the adults descend the streams while the alewives are passing up. This migration to the sea happens about the 12th, when there is the heaviest run, although many may be taken on subsequent nights. If the sky is clear and cloudless the catch is never so large as when dark and stormy. Late in the month several barrels of menhaden (*Brevoortia tyrannus*) were taken at Cuttyhunk, while throughout the month the skimming-net caught multitudes of young herring (*Clupea harengus*). *Fundulus heteroclitus*, ripe with eggs, was captured in great numbers at Falmouth on the 13th, where were also found two species of stickleback (*Gasterosteus bispinosus* and *Apeltes quadracus*), both sexually mature. An abundance of breeding pipe-fish (*Siphostoma fuscum*) were seined from eel-grass on May 13th, and they have been found, with pouches filled with eggs, as late as July 13th. The first mackerel (*Scomber scombrus*) was taken on May 3rd. A few butter-fish (*Rhombus triacanthus*) were taken in a trap at Cuttyhunk on the 11th, though reported at West Dennis on the 5th. They spawn in June.

Among the Serranidæ, *Roccus lineatus* usually arrives in May, although the present year we did not secure specific data. The white perch (*Morone americana*) spawns during this and the following month, and the sea-bass (*Centropristes striatus*), first seen on the 10th, was taken in large numbers on the 12th. It spawns in June. The scup (*Stenotomus chrysops*) were abundant at Cuttyhunk on the 11th, when thirty barrels were taken. It is said to spawn early in June. The squeteague (*Cynoscion regalis*), first taken in April, was occasionally brought to the station in May. The puffers (*Spheroides maculatus*) appeared during the latter part of the month, and a fine lumpfish (*Cyclopterus lumpus*) was also captured. The latter is said to breed in April. The Gurnards were represented by both *Prionotus carolinus* and *Prionotus strigatus*. It is estimated that there were at least one thousand in the trap on the 13th. Specimens examined on the 16th were not ripe, though the ovaries were large.

The Gadidæ abounded. Beautiful great pollock were almost daily brought to the laboratory; cod were so numerous that they found no market, and white hake (*Phycis tenuis*) were a positive annoyance to the fishermen. When so many inland laboratories are inadequately provided with animals for dissection it seems a great pity that hundreds of barrels of this beautiful material should yearly go to waste.

Among the Pleuronectidæ the summer flounder (*Paralichthys dentatus*) was often taken. The four-spotted flounder (*Paralichthys oblongus*) and the window-pane (*Bothus maculatus*) were abundant. Eggs of the four-spotted flounder were ripe in May, and have been hatched in the Chester jars. The period of incubation is about eight days. The eggs of the window-pane are of about the same size as those of *P. oblongus* and readily fertilize. The good eggs soon rise to the surface, leaving the immature and injured eggs at the bottom. The sole (*Achirus fasciatus*) was apparently ripe the latter part of the month. *Lophius* was abundantly taken from the 'Sound' traps on the shore of Marthas Vineyard.

Molgula and *Ciona* were ripe throughout the month.

Crustacea.—*Gammarus annulatus* occurred in swarms. The tow-net at one haul, on the 16th, contained over two quarts, and the animals were so numerous that in places they gave a distinct color to the water. Many had eggs. On the 23d they were only occasionally found. *Orchestia agilis* bears eggs in May, and is, of course, abundant. When *Cyanea* comes to Woods Holl in May, it is often accompanied by *Hyperia*; the crustacean bears at this time most beautiful great eggs, almost perfectly transparent. On May 6, 1892, many were collected at Woods Holl, and on June 8, 1893, they were abundant in Narragansett Bay. *Idotea* was found at Nahant with eggs, May 20, 1893.

Schizopods, adults laden with eggs and young, were daily taken. Lobsters began to hatch on the 16th, and thousands were planted in Vineyard Sound during the latter part of the month. *Crangon* was often heavy with young, though *Palæmonetes* did not deposit its eggs until the latter part of the month. *Eupagurus longicarpus* was found bearing well-developed eggs on May 9, 1890, and on May 16th the eyes of the embryos could be seen. *Carcinus granulatus* often had eggs, as did *Gelasimus* and *Libinia*. The crabzœa were first taken in the skimmings on the 10th, and were abundant on the 11th. *Hippa*, though often taken, was without eggs. Pairs of *Limuli* might have been collected by the hundred.

Vermes.—The tow-net brought in many surface forms. On the 7th *Autolytus* was taken, but without eggs. On the 10th several egg-bearing individuals were noted, and on the 11th Dr. Mead saw a male

swim about like an excited *Nereis limbata* and finally fasten to one of the females with his jaw. Throughout the latter portion of the month *Autolytus* was taken in abundance. On May 17th swarms of Terrebellids were observed to migrate from the clusters of *Parypha*, brought to the laboratory from Quick's Hole, and to gather on the sides of the aquaria. *Lepidonotus* bred throughout the first half of the month, and ripe females have been found as early as April 25th. Dr. Mead informs me that if the females are captured during the day they will deposit their eggs at about 6 p. m. The ripe females are generally greenish drab on the lower side, while the males are pinkish white. If the stagnant water, in which the animals have been retained during the day, is replaced by fresh sea-water the eggs or sperm will be seen to leave the nephridial openings of the posterior two-thirds of the body in streams. Since the eggs after fertilization settle to the bottom, the water may be renewed without difficulty. The embryos swim in from eight to ten hours and the gastrula stage is reached in about twenty hours. *Harmothœ*, found in the same localities as *Lepidonotus*, from which it is distinguished by having eighteen rather than twelve pairs of scales, breeds about one week earlier. The eggs may be secured and fertilized in the same way as those of *Lepidonotus*. The ripe females are bright pink on the lower side.

Dr. Mead found *Scolecolepis viridis* and *Clymenella torquata* breeding during the early part of May. The eggs of the former species are found in the sand-tubes; those of the latter are very large, but difficult to secure because of the shortness of the breeding season. Specimens absolutely ripe extrude the eggs in confinement, but if not absolutely ripe the eggs degenerate without being extruded. *Nereis limbata* was found swimming on the surface on the 13th. *Spirorbis* breeds during May, and the fully formed embryos may be shaken from the *Fucus*, to which the adults are attached. Fine large egg-bearing specimens of *Sagitta* were abundant until the middle of the month.

Dr. E. G. Gardiner reports that the small acœlous planarian, *Polychœrus caudatus*, was repeatedly found, that several examples of a large species of *Monotus*, collected near the Laboratory, laid thousands of eggs upon the walls of the glass jars in which they were confined, and that *Plagiostomum* freely laid in captivity. He also found great numbers of *Dinophilus*.

Mollusks.—The squid (*Loligo pealii*) made their appearance on May 7th, when several hundred were taken at Hadley Harbor. Many eggs in early stages of development were found, and the animals occasionally laid in the aquaria. Artificial fertilization is easily accomplished. Many squid were taken throughout the month, and one egg-mass found attached to a fish trap filled a large bucket. *Urosalpinx* was found breeding on the 21st. The sand-collars of *Lunatia* were frequently brought into the Laboratory, and naked mollusks often deposited their eggs in the aquaria.

Echinoderms.—On May 10th *Echinarachnius parma* showed no sign of exhaustion; larvæ of *Cribrella* were taken in the tow-net, and the Ophiurans, abundant at North Falmouth, contained only immature eggs. An earlier note, made at Nahant, reports *Ophiopholis* as ripe May 20, 1893.

Cœlenterates.—*Pleurobrachia rhododactyla* was not abundant. The reproductive elements were found to be ripe by Dr. McMurrich towards the end of May, 1890. *Berœ* was taken at Newport, R. I., on May 7, 1896, and at Bristol, R. I., on May 15th. *Mnemiopsis* and *Cyanea arctica* were only occasionally found. The planulæ of the latter may be easily raised in the Laboratory. They attach themselves in from seven to ten days after the eggs have left

the parent. A few *Aurelia* of medium size were taken on the 7th, and again on the 16th, 17th, 18th and 19th.

On May 10th a few small specimens of *Tubularia couthouii* were dredged at Quick's Hole, and the large stems of specimens dredged on the 17th seemed to show signs of regenerative processes. On the 11th hydromedusæ were hatched from hydroids of *Obelia*, and on the 13th a few were seen in the water around the station. *Tima formosa* was not seen during the month, though in 1896 the species was abundant in Narragansett Bay. H. C. BUMPUS.

NATURAL HISTORY MUSEUMS (II.).

THE MUSEUM AS A TEACHER.

THE museum, by an intellectual treatment of its collections, has, as I have shown already, discharged a large part of its function as a teacher. It remains for it to provide guides and lectures. The guides can be small books, leaflets or albums. The lectures are a more important feature. They are inaugurated in many museums; the series given in Washington, under the auspices of the National Government, and those given in London by the British Museum are examples illustrating this feature at its best. Lectures demand for their best popular value a combination of a firm and thorough command of the subject, a simple and yet adequate verbal exposition which may with some, according to their exceptional talent, assume a high literary quality, and lastly ample and stimulating illustration, either in slides by projection or in natural specimens. It is unnecessary to discuss the best form of a lecture. One point can be conclusively claimed, that the feature of entertainment should not expel out of all semblance of existence correct definite instruction, and that the philosophy of the topic should not be presented in broken half-truths, but envelop the listener with the penetrating atmosphere of thought.

THE MUSEUM AS AN INVESTIGATOR.

The museum completes its scope of relations to the great world of scientific interests when it uses its resources in the prosecution of original research and in publishing that which requires publicity. Biological problems are more naturally carried on in schools devoted to that subject, but the gathering of evidences and facts in natural history, facts bearing on distribution of animals, their habits and physiology, the solution of problems in ethnography and archæology, the collecting of new and valuable specimens in geology and mineralogy, the illustration of faunas and floras, description of new species, and revision of old, are topics which naturally engage the attention of the Museum of Natural History. The series of publications that have proceeded from the Smithsonian Institution, the National Museum, and the Museum of Comparative Zoology at Cambridge, form a library of research and generous compilation almost unrivalled.

THE AMERICAN MUSEUM OF NATURAL HISTORY.

In 1867 New York was without a museum. The American Academy of Arts and Sciences had in Boston brought together collections which formed a nucleus for yearly accretions, and furnished material for study and publication. In Philadelphia Franklin had unmistakably imparted, by example and a contagious influence, the spirit of research to groups of scientific minds. The American Philosophical Society and the Philadelphia Academy of Sciences by their important papers, the accumulation of a varied store of material, and the establishment of a remarkable library, furnished the most significant monument to the imperishable ardor of the great printer.

In Washington Smithson had laid the foundation of a museum and established a