Fig. 4 is an air curve plotted from figures given in Dulong and Petit's paper. It is drawn to such a scale that the rate of heat conduction at atmospheric pressure is the same as in my own experiment with air in the large bulb, and illustrated in Fig. 2. The first five stations in the curve are the ones from which they deduced their 'Sixth Law' of cooling. The rest of the curve is drawn in accordance with that law, and the vacuum line represents exactly the value they assigned to the cooling power of an absolute vacuum. Comparison with Fig. 2 shows how much they erred in their deductions.

A study of the curve embodying the results obtained with a mixture of three volumes of hydrogen, and five volumes of carbon dioxide in a small bulb, shows that the carbon dioxide interfered very greatly with the performance of the hydrogen. Before any exhaustion was made, the hydrogen *alone* would have done more than three times the work of both gases. It was not until the pressure had fallen to about one hundred millionths that both gases combined, did as well as the hydrogen would have done alone. Below this pressure both gases contributed to the result.

This interference of mixed gases is a very interesting phenomenon, and seems to warrant the careful investigation which it is my intention to give it.

CHARLES F. BRUSH.

CLEVELAND, O.

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

THROUGH the courtesy of the United States Commissioner of Fish and Fisheries, several naturalists have been enabled to make use of the equipment of the Biological Station at Woods Holl during the past month, and the following notes may be of interest to those who contemplate pursuing lines of investigation at either of the marine laboratories:

The water has swarmed with animal life, and many forms rarely or never captured during the warmer months have been found in abundance. Breeding animals have yielded rare embryological material, and all forms of life have had great vitality, due probably to the low temperature of the water. The temperature of the water has ranged from 38 F. at the beginning of the month to 43 F. on the 30th. Its specific gravity has varied from 1.0232 to 1.0236.

Among vertebrates the winter flatfish (*P. americanus*) has been taken in large numbers, and spawning individuals have yielded an abundance of embryos and young. The clustered eggs of the small sculpin (*Acanthocottus æneus*) have been taken from nets and from sea-weed, and the young have been conspicuous in the *Auftrieb*. The surface towings have also yielded young of the common cod (*G. callarias*), eggs of which were hatched at the Station during the earlier portions of the month. Young cod, from one-half to three-fourths of an inch in length, have been found feeding exclusively upon Copepods, and associated with them were the somewhat larger pollock (*Pollachius virens*). The Gadidæ have also been represented by numerous adult 'frostfish' (*Microgadus tomcod*), though the breeding period of this species is in December. The young of the sand-launce (*Ammodytes americanus*), from one-half to one inch in length, and of the eel (*A. chrysypa*), from two to two and one-half inches in length, have also been taken. The pipe-fish (*Siphostoma fuscum*) was not examined, though it was found in Narragansett Bay with eggs and with young March 22, 1897.

The 'alewife' or spring herring (*Pomolobus pseudoharengus*) has begun to enter the fresh-water streams from the sea, though it has not yet begun to deposit its eggs.

Several Crustacea are already breeding. The green crab (*Carcinus granulatus*) is car-

rying about its orange-colored clusters, and Mysis has its brood-pouches distended with embryos. Several species of Amphipods bear eggs. One of these is a large light-colored species, apparently in the height of its breeding season; thousands have been captured in small traps baited with fish. Associated with this amphipod and captured in the same manner, though not breeding, were numerous examples of the Isopod, *Cirolana concharum*. Enormous, bright-colored Caprellas were dredged in the 'Sound,' and many eggs were taken. *Crangon vulgaris* is breeding, of course, and it would be interesting to learn when this species is not pregnant. *Palæmonetes vulgaris*, *Virbius zostericola* and *Hippolyte pusiola* have been frequently taken, the latter with eggs. The Eupagurids (*E. Bernhardus*, *E. longicarpus*, *E. policaris* and *E. annulipes*), though showing enlarged ovaries through their transparent body-walls, have not extruded their eggs. The same may be said of *Gebia affinis* and *Callianassa stimpsoni*, many individuals of which were taken in Narragansett Bay on March 8th, of the present year.

Limulus has not yet approached the shore, though a single specimen was taken in a fyke-net at Waquoit on March 25th. No Cirriped larvæ have been taken. On January 3, 16 and 22, 1896, great numbers of these nauplii were taken at Bristol Narrows, R. I., and on February 14th they were still common, though not so abundant. Of course, Copepods have formed a large proportion of the organisms taken at the surface, and they appear to be even more abundant than during the summer months. Volumetric data respecting the Plankton are much desired, though the efficiency of the ordinary methods for securing Plankton will be materially affected by the annoying presence of a gelatinous alga, which quickly renders the net all but useless.

Vermes.—Having seen myriads of *Nereis virens* swimming in the shallow water of the shores of Narragansett Bay, and having collected several hundred specimens on March 23, 1897, when the water was actually colored with the extruded eggs and spermatozoa, we were not surprised to find several individuals swimming about at Woods Holl. The eggs of this species have not been carefully studied, though they offer some interesting features to those at work upon cell-lineage. Specimens of immature eggs were taken on January 29, 1896, and at Bristol Narrows on March 26th of the same year there were scores of 'spent' males. The height of the breeding season, then, is probably during the earlier and middle portions of the month of March. Annelid larvæ of other species have been abundantly taken both in January and in February.

Heteronereis limbata was found at Woods Holl, swimming about on the surface, in broad daylight. The males, on examination, proved ripe. *Autolytus cornutus* was frequently taken with eggs, and *Harmothœ* and *Lepidonotus* appeared to be almost ripe. *Chætopterus*, *Rhynchobolus*, *Maldane*, *Sthenelais*, *Trophonia*, *Clymenella*, and *Phascolosoma* were collected, but not in sufficient numbers to definitely determine their sexual condition. *Sagitta* was excessively abundant, and the large clear eggs could easily be seen through the transparent integument.

Mollusca. — Cephalopod mollusks have not arrived, and time has not permitted the examination of the Lamellibranchs. The egg-capsules of the smaller Gastropods, so abundant later in the season, were conspicuous by their absence. Naked mollusks of gorgeous coloring were dredged in the 'hole' and 'sound.' *Doto coronata*, *Eolis bostoniensis* and *Alderia harvardiensis* were the most abundant species; the two latter are breeding in the laboratory.

Echinoderms.—There is every indication that April will be an excellent time for one who wishes to secure an abundance of Echinoderm material, either for embryological or for experimental study. The star-fish are approaching sexual maturity. The most attractive eggs are those of the 'sand-dollars' (*Echinarachnius parma*). Bushels of this echinoid were dredged off Quick's Hole. The eggs readily fertilize and develop normally. The first cleavage occurred two hours after fertilization; the gastrulation occurred in from 30 to 36 hours. 'Plutei' from embryos hatched on March 22d were raised without difficulty, and are now, at the end of the month, still living. I regret that observations on the breeding habits of the Holothurians were not made.

Cœlenterates.—The wealth of Cœlentarete life found during this month is bewildering and distracting. Ctenopores (adult *Mnemiopsis* and *Pleurobrachia*) hydro- and scyphomedusæ abound. The *Ephyra* and young of *Aurelia* were taken at Waquoit in countless numbers and lived in the laboratory from the 16th to the close of the month. On March 30th the calm surface of the water in Great Harbor was literally spangled with the slightly protruding discs of *Cyanea*. The piles and rock-work of the 'basin' are covered with breeding 'Hydroids' of *Coryne*, *Clava* and *Parypha*. The dredge has brought up *Sertularia argentea*, laden with eggs, and, most beautiful of all, enormous specimens of *Tubularia couthouyi*. The expended hydranths of this species are as large as 'bachelor's buttons,' and are borne upon a stalk several inches in height. They literally droop with their burden of ripe gonophores. The young are possessed of remarkable vitality and would make excellent material for experimental work. *Tima formosa*, though abundant in Narragansett Bay from January to March in 1896, has not thus far been seen either in the 'Sound' or in Buzzards Bay. *Metridium*, *Sagartia*, *Halcampa* and *Astrangia* have been taken, though an examination of their reproductive glands has not been made. *Grantia* is not abundant, and the individuals collected were small and apparently immature.

H. C. BUMPUS.

THE ANNIVERSARY MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE local committees for the Boston meeting—the fiftieth anniversary to be celebrated from August 22d to 27th—have now been arranged, and contain the names of a greater number of men of science and men interested in science than could probably be secured in any other city of the United States, not excepting New York and Washington. His Excellency, Roger Wolcott, Governor of Massachusetts, is Honorary President of the Committee; Colonel Henry L. Higgenson is the Honorary Treasurer and Professor Thomas Dwight, Professor Alpheus Hyatt and Professor E. C. Pickering are the Honorary Secretaries. The chairman of the reception committee is Dr. J. R. Chadwick; of the committee on rooms for meetings, Professor Charles R. Cross; of the committee on invitations for foreign guests, Professor H. P. Bowditch; of the committee on excursions, General Francis H. Appleton; of the Cambridge committee, President Chas. W. Eliot; of the Salem commitee, Hon. Robert S. Rantoul, and of the executive committee, Professor William T. Sedgwick. The Local Secretary is Professor H. W. Tyler, Massachusetts Institute of Technology.

Professor F. W. Putnam, President and until the meeting Permanent Secretary, has prepared the following letter calling attention to the meeting: Early in the year 1897 the Boston Society of Natural History appointed a committee to take the initiative in extending an invitation to the Associ-