Oceania, and, incidentally, by Bunting, in *Hydractinia*. The most nearly comparable observations, so far as I have been able to discover, are those recently reported by Andrews in *Hydra*.

This work was begun at the Marine Biological Laboratory in 1897, continued during 1898, and is still in progress. It is hoped that a fuller account, with definite illustrations, may soon appear.

Grafting Experiments upon Hydromedusæ. CHAS. W. HARGITT.

IN course of previous work upon regeneration among the Hydromedusæ, the problem of grafting was forcibly impressed upon me, and during the summer of 1898, at the Marine Biological Laboratory, was undertaken and followed up during nearly two months, and with results as briefly outlined below.

It was undertaken to show the practicability of uniting sections of different individuals, different species and even genera.

The first work undertaken was upon Hydroids, chiefly Tubularians, *e. g.*, species of *Eudendrium*, *Pennaria*, *Parypha*, *Clava*, with only one series of experiments upon a Campanularian. The latter was for some reason almost wholly negative in results. In all the former the results were unusually successful, no less than 10% responding within the limits indicated. To merely summarize:

1. No difficulty was found in securing perfect union between segments of the same species in from twelve to twenty-four hours. A delicate sheath of perisarc overlapping the proximal ends was first secreted, and this was followed by organic union of the cœnosarc of the hydroid. The grafting was equally successful whether made by oral, aboral or alternating contact of the segments. Abundant heteromorphism was secured along with the other results. 2. It was equally easy to secure union of male and female specimens of the same species. 3. If the distinctness of Agassiz's species of *Eudendrium dispar* and *ramosum* is to be maintained—a fact which has seemed to me doubtful—then there was secured a ready grafting of different species. 4. In no case was I able to secure successful grafting between different genera. This was tried repeatedly with several, but in each case with negative results.

The second problem undertaken was upon the medusæ. The most accessible form was *Gonionemus vertens*, and the results obtained were on this form alone. Grafting was made possible only by the expedient of paralyzing the specimens by emargination of the entire bell, thus removing the coördinating centers. This done, there was no more difficulty in securing perfect union of different portions of the body than with the hydroid forms. It mattered little from what portion of the body taken, or in what relation placed, perfect union was usually secured in from 24 to 48 hours. Two medusæ grafted orally recovered nervous activity, and even exhibited a definite coördination, the double medusa acting as one.

The Life-History of Dicyema. WILLIAM MORTON WHEELER.

A STUDY of the Dicyemidæ (*Dicyema coluber*, n. sp.; *Dicyemennea Whitmanii*, n. sp., and *Dicyemodeca sceptrum*, n. gen. et n. sp.), parasitic in the kidneys of the West Coast *Octopus* (*O. punctatus*), was undertaken with a view to answering the following questions concerning the life-history of these animals: 1. What are the relations of the nematogenic and rhombogenic individuals to each other? 2. What is the meaning of the so-called infusoriform embryo? 3. What is the meaning of the infusorigen? An examination of the parasites of one hundred *Octopus* of different ages led to the conclusion that the Dicyemidæ first reproduce as nematogens for several generations, but that

ultimately the same individuals become rhombogens and thenceforth produce only infusoriform young. Certain Dicyemids were found to contain both vermiform and infusoriform young. E. Van Beneden's view, that the infusoriform is the male Dicyemid, was confirmed by a study of its structure and a comparison of this form with the male Orthonectid (Rhopalura). From the fact that deeply staining bodies resembling the granules of the urn of the infusoriform, and probably for that reason spermatozoa were found among the germ-cells of the infusorigen, it was inferred that the infusoriform young may arise from fertilized ova, and that the infusorigen may be an adaptation for accumulating the germ-cells around a central cell to which the spermatozoa are also attracted, possibly by chemotaxis. It was regarded as probable that both the male (infusoriform) and female Dicyemid migrate into the kidneys of the young *Octopus* and there form colonies of nematogenic females before males are produced.

Notes on the Blind Fishes. C. H. Eigenmann.

1. There is a color pattern common to all the species of the Amblyopsidæ. This pattern is due to the arrangement of the chromatophores along the connective tissue septa separating successive muscle segments. The result is a series of longitudinal stripes where the septa are bent on the surface and a series of zigzag cross streaks. This pattern is best marked in *Chologaster agassizii*, in which but little color is present. It is somewhat obscure in *Chologaster cornutus* on account of the great development of pigment. It remains only as an arrangement of chromatophores in the blind members of the family where color is no longer present in sufficient quantity to be evident to the naked eye.

2. *Chologaster agassizii*, which has so far been known from the type only, was secured through a grant from the Elizabeth Thompson Science fund. It is a species with well developed eyes living permanently in caves. Its eye is notably smaller than that of the other species of *Chologaster* which live in open waters. The retina is very much like that of *C. papilliferus*, with thinner pigment layer. The eyes of the species of *Chologaster* show the following measurements:

C. papilliferus, 32 mm. long. Vertical diameter, .832 mm. Longitudinal, .880 mm.

C. agassizii, 39 mm. long. Vertical diameter, .720 mm. Longitudinal, .800.

C. cornutus, 32 mm. long. Vertical diameter, .960 mm. Longitudinal, 1.120.

Thickness of the retina of

C. papilliferus, 29–34 mm. long, .122 mm., 55 mm. long, .162 mm.

C. agassizii, 38 mm. long, .107 mm., 62 mm. long, .130 mm.

C. cornutus 27 mm. long, .73 mm., 43 mm. long, .83 mm.

3. The blind fish from Missouri is of different origin from the blind fishes east of the Mississippi. The details of this part of the paper have appeared in Science.

Regeneration and Regulation in Hydra viridis. Herbert W. Rand.

In a series of regeneration experiments upon *Hydra viridis* it was found that the polyps regenerate, on the average, fewer tentacles than are originally possessed. The more tentacles before regeneration the greater is the mean number after regeneration. Eight-tentacled *Hydras* showed the greatest reduction in the number of tentacles. Six-tentacled *Hydras* showed no reduction.

The average deviation from the mean was practically the same before and after regeneration. The average deviation from the mean after regeneration, and also the average deviation from the original number, was greater in the eight-tentacled groups and least in the six-tentacled.

The mean number of tentacles regenerated by whole six-tentacled *Hydras* was