The scales of lepidoptera. By M. B. Thomas.

The ægeria of central Ohio. By D. S. Kellicott.

Some insects of Tasmania. By F. M. Webster.

[abstract.]

Although occupying a position in the southern hemisphere similar as to latitude to the northern half of Indiana and southern Michigan, the insect fauna more nearly resembles that of southern Texas, being strikingly semi-tropical. In the vicinity of Hobart, during the last of January, a season corresponding to our August, Phytophagus coleoptera, especially of the Chrysomelidæ and Rhynchophora, were very abundant, while carnivorous species, though strikingly poorly represented, included several Coccinellidæ and one Lepidopterous species—a rare object in any country. A noticeable feature, but one peculiar to island insects, was the lack of flying species along the coast.

A single butterfly, swift and strong of wing, was the only capture made in Lepidoptera. Another feature of island insects was noticed in the preponderance of species of a bronzy or yellowish color. The young eucalyptus trees afford a rich field for collectors during the summer season.

Early published references to injurious insects. By F. M. Webster.

The continuity of the germ plasm in vertebrates. By Carl H. Eigenmann. Published in part in the Journal of Morphology, pp. 481–492, plate XXXI, 1892, under the title "On the precocious segregation of the sex-cells in *Micrometrus aggregatus* Gibbons."

The theory of the continuity of the germ plasm as finally formulated by Weismann assumes that "there is not only a continuity between the ovum which gives rise to parent and the ovum which gives rise to the offspring" but in the successive generations between the ovum which pro-

duces the parent and the ovum which produces the offspring the character of the original ovum is never lost by differentiation. There is then a continuous chain of reproductive cells quite apart from the body cells or more frequently a series of body cells through which the unchanged germ plasm of the parent is transmitted to future generations. The germ cells are, therefore, not the product of the adult body but the direct offspring from the germ cell of the preceding generations.

The observations bearing out much of this theory have been mostly confined to invertebrates. All of our works on the comparative anatomy of vertebrates, as well as our works on embryology, tell us that the sexual organs in vertebrates arise from the germinal epithelium which is not differentiated until the embryo is completely formed. The most lucid descriptions of the early stages were given by Balfour for Elasmobranchs ten years ago, and the latest observations published by Jungersen in 1889 have not given anything concerning the stages less than two millimeters long.

While preparing the sections for the ontogeny of *Cymatogaster aggregatus*, one of the viviparous Embiotocidae, I frequently observed large, indifferent cells in the mesoblast. I at first supposed them to be cells in a pathological condition. When, however, all the eggs from one ovary were observed to contain such cells, I re-examined every embryo, and soon found that the cells are not pathological, but are a normal structure present in all embryos of a certain age. Further study showed them to be sex-cells of the future germinal epithelium. Our knowledge of the early stages of the sex-cells of vertebrates does not extend back beyond the condition described by Balfour and Jungersen. In the present study I have been able to trace them back to probably the fifth segmentation.

Our knowledge of the sex-cells in general has been summed up by Weismann as follows: "In certain insects the development of the egg into the embryo, that is, the segmentation of the egg, begins with the separation of a few small cells from the main body of the egg. These are the reproductive cells, and at a later period they are taken into the interior of the animal and form its reproductive organs. Again, in certain smaller fresh-water crustacea (Daphnidæ) the future reproductive cells become distinct at a very early period, although not quite at the beginning of segmentation, *i. e.* when the egg has divided into not more than thirty segments. Here also the cells which are separated early form the reproductive organs of the animal. The separation of the reproductive cells from those of the body takes place at a still later period, viz. at the close of segmentation, in Sag-

itta, a pelagic free-swimming form. In vertebrata they do not become distinct from the cells of the body until the embryo is completely formed." It will be seen that in some vertebrates (*Cymatogaster*) a similar segregation of "germ plasm" takes place quite early. In brief, the sex-cells of *Cymatogaster* first become normally conspicuous in the mesoblast where the germ layers are fused before any protovertebræ are formed. They can be seen in earlier stages, but they do not stand out so prominently from the other cells. In exceptional cases, the sex-cells can be traced back to probably the *fifth* segmentation.

The sex-cells can first be distinguished from the surrounding cells about the time the blastopore closes. The earliest ones distinguishable, exclusive of abnormal cases, are from an ovary in the eggs of which the blastopore is not yet closed, or is just closed and in which the mesoderm is not yet split off from the entoderm. Only two cells which can with certainty be said to be sex-cells are seen in one of these eggs. They differ from the surrounding cells in having well-defined, rounded outlines, and in the distribution of the chromatin in the nucleus. The chromatin of the surrounding cells is collected in one, or, if the cells are undergoing division, in two or three masses. The chromatin of the sex-cells is uniformly distributed in small granules.

In the eggs of another ovary, in which thickenings are formed for some distance, and the mesoblast is separated from the entoderm by a well-marked line, the sex-cells stand out from the surrounding cells with great prominence. This is not due to any marked change in the sex-cells themselves, but rather to the fact that the surrounding cells have undergone further division and are crowded so that the boundaries are not defined, while those of the rounded sex-cells are well marked.

The largest and most conspicuous cell of this stage lies in the mesoblast just beside the chorda. It measures 18x23 *m*, and has a nucleus measuring about 6 *m*. On comparing this with segmenting eggs, it is found that it agrees in size with some of the cells of an egg undergoing the ninth segmentation and in all probability it is a cell remaining unchanged from that stage. It contains yolk particles. Most of the sex-cells are collected in a limited region at this stage in the thickened portion of the embryo, where the three germ layers fuse. This would lend force to the supposition that they are derived from two cells at most—one dextral and one sinistral. There are a few scattered cells in other parts of the embryo which cannot be so derived unless they early migrate from their original position.

There are, on an average, thirteen sex-cells in an egg of this stage. The largest number noticed is seventeen, the smallest nine.

In a larva just hatched, the longest diameter of which, measuring in a straight line, is 0.45 mm., there are ten sex-cells. In this embryo about nine protovertebræ have been formed. Most of the sex-cells are large, the largest having a diameter of 23 *m*, with a nucleus of 8 *m*. The smallest cell measures but 11 *m* in diameter. The *distribution* of these cells has become markedly changed from the conditions obtaining in the two-protovertebræ stage. Two of the cells, in the embryos examined, are found in the cephalic region, one on either side a short distance posterior to the origin of the chorda. The remainder are distributed as follows: one below the seventh sinistral protovertebra; three in the left side of the tail, *i. e.* in the region in which protovertebrae have not yet appeared; and three in the right side of the tail.

The cells in this stage stain deeper and much more uniformly than the surrounding cells with Grenacher's hæmatoxylin. They greatly resemble the very early conditions of these cells, and the number would seem to indicate that there has been no segmentation since the two-protovertebræ stage. In other larvæ of the same stage there are ten, eight, five, and nine cells, respectively.

In larvæ 2.5 mm. long there are fourteen to sixteen cells and the number cannot have been increased much since their earliest condition, even if we assume that two or more have been lodged in the gill region, and two in the anterior part of the body. The majority of the cells in this larva are confined to a region only 0.20 mm. long; and if we consider the doubtful cells in the anterior region, the total length over which these cells are distributed is about 0.50 mm. from the anus forward. The sex-cells in this stage measure 9–13 *m*. Balfour's admirable account of these "primitive ova" (Elasmobranch Fishes, pp. 130–136) might almost be used bodily to describe the same structures in *Cymatogaster* and *Abcona* 2.5 mm. long. He observed that the younger ones contain many yolk spherules, and suggests that the cells themselves may have migrated to their position from a peripheral portion of the blastoderm, since "they are the only mesoblast cells filled at this period with yolk spherules." He was at a loss as to how they arose, and thought he could detect cells intermediate in size between them and the neighboring cells. As has been seen, the yolk particles simply remain unchanged from the original condition when the sex-cells are segregated.

Several figures would seem to indicate that one of the larger cells of an early stage divides and gives rise to the groups of smaller cells in a later stage. This can scarcely be the case, since the number of cells in the earlier and later stages are about equal, unless a number of the earlier cells atrophy or are resorbed. The loss of four cells, two in the gill region, and two in the region of the fifth body somite, is probable, but even with the addition of these, the number of cells in the last stage examined does not exceed the average number in early stages when the cells are quite large. The reduction in size can, therefore, be explained only by supposing that the individual cells are reduced in size during development. It would be interesting to consider here the causes that lead these sex-cells to again grow and divide. Since, however, this process does not begin in the stages under consideration, this matter must be left till later stages are examined.

Biological Stations. By Carl H. Eigenmann.

The early naturalists noted briefly the animals and plants they saw at home or abroad. A few centuries later they added figures to their enumerations. Later still skins were preserved, and last of all the whole animals were preserved, gathered into large museums, where they soaked and rotted twenty-five years, perhaps, before some one came along to study them. Some of our ornithologists and conchologists, and even some ichthyologists have not yet passed beyond this skin stage in their development. Many others, on the other hand, have passed this last stage and have ceased to content themselves with the catalogueing of specimens and now study the method, whys and wherefores of the things about them.

This school was established when Johannes Müller first dipped a net for pelagic animals. When it was found that the hows, whys and wherefores could best be studied in the lowest creatures, naturalists flocked to the sea shore, at first during their vacations. As methods for study increased and apparatus multiplied permanent Marine Biological Stations were evolved. First of these were the Naples Zoological Station and Agassiz's School at Penikese, both established in 1873. The aims of the two were slightly different. The Naples station was for original investigation. The Penikese school it was hoped would awaken an interest in zoology in America. There are now a large number of stations along the European coast, some large and some small, but it is not the intention to speak of these.