small enclosure of fine wire gauze in a dish of water. Several males were placed in the dish outside the enclosure, but none of them paid the slightest attention to the females, although they seized the females quickly enough when the enclosure was raised and the females were allowed to scatter through the dish. It is only when the males accidentally collide with the females while swimming that any attempt is made to seize them. When a female collides with another amphipod she curls up and remains quiet for a time, when, if not seized, she soon passes on. When two males collide, each apparently attempts to seize the other and carry him about as a female would be carried. Males have the instinct to seize and carry about other amphipods they meet with, and are only prevented from so doing by the similar attempts of the other individual. Males which are mutilated by the removal of the large second pair of gnathopods, so that they are no longer able to make effective resistance, are seized and carried about by other males just as females would be carried. Sex recognition in this species is apparently determined by the different modes in which the two sexes react to the contact of other individuals.

Some Notes on Hybridism, Variation and Irregularities in the Division of the Germ-cell: Michael F. Guyer.

At one stage in the maturation of germ-cells, preceding the true reduction division, bivalent chromosomes are formed ordinarily; that is, only half of the regular number of chromosomes appear, but each of the new chromosomes is apparently double and equivalent to two of the simple type. In the spermatogenesis of hybrids, the formation of the bivalent chromosomes is frequently incomplete or defective, so that the resulting divisions are irregular and unequal. The greater the difference between the two individuals crossed, the more marked is the disturbance in the maturation of the germ-cells of the hybrid offspring. In a paper two years ago before a meeting of the Western Naturalists (abstract, Science, February 16, 1900), I discussed this point in the case of hybrid pigeons and I suggested that these peculiarities in chromosome formation might point to a tendency in the chromatin of each parent species to retain its individuality, and that the extreme variability seen in the offspring of fertile hybrids was possibly to be attributed to this variability in chromatin distribution. In hybrid plants (cannas) I have since determined that practically the same irregularities occur, and, recently, Juel described abnormalities in the germ-cells of hybrid plants which are in nearly every respect parallel to those which I found in the pigeon; hence it seems to me that the same possible interpretation presents itself. Moreover, perhaps the same conception will hold in the case of the many plants, such as the geranium or apple, which will not come true from seed, but require propagation by means of slips or grafts.

To test this I have recently undertaken a study of the formation of the pollen grains in the geranium and I find that in it, as in hybrids, irregularities in the first division of the pollen mother-cell frequently occur, though in a less degree. In answer to the question as to why a plant will come true from a graft or slip and not from seed, it seems possible that we may have a clue in this apparent inability of the chromosomes to fuse normally to form the bivalent type of chromosome. In hybrids it would seem that the chromosomes from each parent lie side by side and divide in an ordinary manner to construct and maintain the body, but that when the germ-cells are to be matured the usual doubling of chromosomes which occurs at such times is incomplete, the result being that the chromatin is un-

equally distributed to the later cells. In a less degree, the same thing occurs in the pollen cells of such plants as the geranium. No fusion of the chromosomes is necessitated in the slip; hence, they continue to lie side by side and divide in the ordinary way, and the new plant is practically a continuation of the old one.

Relative Variability of Pectens from the East and West Coasts of the United States: C. B. DAVENPORT.

Pecten irradians from Tampa, Florida, and *Pecten ventricosus* from San Diego, California, are closely related species, as the parallelism in color and markings indicates. They are a pair of species that, taken by themselves, favor the view of a recent connection of the Gulf of Mexico and the Pacific Ocean. In respect to the symmetry of the valve and in respect to the globosity (height divided by length), the San Diego form is much the more variable, as measurements and calculations of the index of variability of ten hundred shells prove. This greater variability of the Pacific form is a fact in agreement with what Eigenmann has found for fishes. It is correlated with the greater physiographic changes in recent times in the character of the shore line of southern California as contrasted with Florida.

An Experimental Study of the Development of the Lateral Line in the Frog Embryo: R. G. HARRISON.

The Ovary and the Reproductive Period: F. H. HERRICK.

Whenever it is impossible or impracticable to determine the reproductive periods of an animal by watching its behavior, the structure of the ovary will usually furnish the clue. This is true of the Crustacea, and probably of all other animals.

My present object is not only to illustrate this fact, but also to settle definitely the spawning habits of the American lobster, concerning which doubt and disagreement still abound. To put the specific question briefly: How often does an adult female lobster lay her eggs? The answer is, every two years, as a rule. This same conclusion was reached six years ago, chiefly from a study of the comparative anatomy of the ovary of animals captured at different seasons, and while confident of its general accuracy at that time, it is now possible to supplement it with observations upon the living animals themselves.

In a single generation of ovarian eggs three stages may be conveniently chosen for special study: (1) The initial stage, when the ova of the preceding generation are laid; (2) the intermediate stage, when those eggs are hatched; and (3) the final stage, when the ovarian eggs have reached their full size and are ready to be expelled from the body. The average size attained by the ova at these successive periods can be determined with sufficient accuracy. The time interval between stages 1 and 2 is known to be approximately one year. The ratio of growth between stages 1 and 2 is approximately equal to the ratio of the volume of the laid egg and that of ova in the second stage, from which it follows that the time interval between stages 2 and 3 is also one year. Further anatomical facts and experiments with living animals also confirm this conclusion.

The adult spawning lobster therefore does not lay her eggs each year, as some have maintained, but every other year, although this normal biennial period is likely to be shortened or lengthened in individual cases. The evidence on which these conclusions rest is ample, and will be given in detail at a later time.

M. M. METCALF,
Secretary.

[*To be continued.*]