The first phase shows a very gradual rise in the percentage of development of the embryo to 14 per cent. at 27°–29°, the primitive streak alone showing. The second phase, beginning with notochord, neural plate and groove, and mesodermic somites, presents an abrupt rise to 54.83 per cent. of normal development at 30.75°.

3. The normal average diameter of the blastoderm of the unincubated egg, as determined from the measurement of fifty-nine individuals, is 4.41 mm. with a standard deviation of 0.4792 mm. and a coefficient of variability of 0.1087.

4. The normal average diameter of the area pellucida of the unincubated egg as determined from the measurement of fifty individuals is 2.51 mm. with a standard deviation of 0.3382 mm. and a coefficient of variability of 0.1347.

5. From 136 blastoderms in which primitive streaks have not developed, the form of the area pellucida is 59 19/34 per cent. round, 12½ per cent. nearly round, 23 9/17 per cent. oblong and 4 7/17 per cent. oval.

6. The normal average volume of the egg, as determined from the measurement of 100 individuals, is 51.67 c.c., with a standard deviation of 4.8602 c.c. and a coefficient of variability of 0.0942. In 85 per cent. of fifteen unincubated eggs where the volume was noted the diameter of the blastoderm varies directly with the volume of the egg, but the variates are so evenly distributed about the average that the general averages of the measurements in this paper would not be especially affected by this element.

7. The introduction of successively higher stages, and the increased growth of blastoderms without primitive streaks as the temperature rises, together with a continued growth of the primitive streak with the non-appearance of other features of the embryo at a low temperature, 20°–21° to 27°–28°, would indicate a direct dependence of ontogenetic organization upon warmth.

Differentiation without Cleavage in the Egg of the Annelid Chætopterus pergamentaceus: FRANK R. LILLIE.

This phenomenon was observed in both fertilized and unfertilized ova. The essential point is briefly this: That by the action of certain solutions the eggs are preserved alive, sometimes for as long as thirty-six to forty-eight hours, although neither cytoplasm nor nucleus divides. During this period the cytoplasm slowly passes through certain well-defined phases of differentiation, the yolk accumulating in a dense mass in the interior and the peripheral cytoplasm becoming vacuolated and ciliated. The ciliated ectoplasm and the yolk-laden endoplasm are analogous to the ectoderm and endoderm of the trochophore, and the phases of differentiation resemble some of the normal processes; though the resulting object can by no stretch of the term be properly called a trochophore.

The solutions employed were sea water with the addition of KCl or $CaCl_2$, or both these salts. The eggs were left in the solutions for an hour and then transferred to sea water. If the solutions were above a certain density, the formation of the polar bodies was suppressed; but this did not interfere with the subsequent differentiation. During the period of time usually occupied by the cleavage the eggs were markedly amœboid; in some cases (especially after $CaCl_2$) throwing out a bewildering number and variety of long pseudopodia, and actually creeping like amœbæ. All intermediate conditions between this and actual cleavage were observed. During this period, in typical cases, the nucleus became enormously enlarged, and some chromatin was diffused through the cell. Fusion of ova frequently took place, and, in solutions containing $CaCl_2$, large numbers frequently fused into a common mass. The nuclear conditions in these large fusion-masses offer an interesting object for study.

At the end of a period slightly longer than in the normal development the ectoplasm became vacuolated and ciliated. By the action of the cilia the eggs often rotated rapidly in the water. In the largest fusion-masses cilia appeared only on restricted areas.

Certain of the phenomena of ontogeny are thus shown to be independent of cell-division. It may be expected that further study of the material and careful analysis of the results will aid in the understanding of the mechanism of the earliest phenomena of development.

In conclusion, acknowledgment was made to the aid received from the subsequent work of A. D. Mead and Jacques Loeb.

The Rate of Growth in Marine Invertebrata: A. D. MEAD.

Ingestion and Digestion in Hydra: ELLIOT R. DOWNING.

Many observers have noted that the mouth of hydra is capable of great expansion, so that it can swallow comparatively large animals. The mouth is not a simple circular orifice; a cleft runs out from the center of the peristome toward each arm, so that it is divided into as many lobes as there are arms, the lobes alternating with the arms. The circumference of the expanded mouth is therefore as great as the contour of this radiate figure. These lobes at the margin of the peristome are double the thickness of the ordinary body wall on account of the greatly increased length of their endoderm cell. They become thinner toward the mouth and also where they merge into the body wall below the level of the tentacles. They are traversed by longitudinal muscle fibers continued from the body wall.

Ingestion is followed promptly by digestive processes. Within a few minutes after ingestion certain gland cells become apparent in the endoderm. These cells contain a nucleus which rapidly enlarges and becomes granular. As noted in the digestive processes of higher animals, these cells are probably forming enzymes. They rapidly decrease and finally disappear as the ferment is discharged into the body cavity. These gland cells stain best with gentian violet after osmic-Merkel.

The digestive process is rapid. Last June I observed a good-sized hydra ingest a young carp 8 mm. long. Seven hours later, as determined by sectioning, no trace of this remained in the digestive cavity. The digested material is absorbed by the endoderm cells, which after a meal are gorged with food spheres; much of this material, especially the oil, is passed on to the ectoderm cells, where it is stored. The fatty substance accumulated at the periphery of these cells forms a layer of droplets which may be stained an intense black by osmic acid. It is these fat droplets which during life give to hydra its brown color.

The History of the Eye of the Blind Fish Amblyopsis: CARL H. EIGENMANN.

The history of the eye of *Amblyopsis* may be divided into four periods:

(*a*) The first extends from the appearance of the eye till the embryo is 4.5 mm. long. This period is characterized by a normal palingenic development, except that cell division is retarded and there is very little growth.

(*b*) The second period extends till the fish is 10 mm. long. It is characterized by the direct development of the eye from the normal embryonic stage reached in the first period to the highest stage reached by the *Amblyopsis* eye.