

**VI THE MIGRATION PATH OF THE GERM CELLS IN
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Investigation of the primary sex cells of *Fundulus* shows that they may be recognized as early as the forty-six hour stage (1.6 mm.), as many as forty-two sex cells having been counted in such an embryo. They were located in the peripheral endoderm, lateral to the posterior half of the embryo. None were observed in that part of the embryo which develops from the head fold. Observations were made upon embryos ranging from one to twenty-four days in age.

The characteristics of the embryo are distinct and constant throughout all phases of the migration of these cells from the peripheral endoderm to the final position in the genital ridge; little variation was noted even in their number during the migration period. There can be little reason for questioning the accuracy of the identification of these cells as the "primordial germ cells" of earlier writers.

The germinal path leads from the peripheral endoderm, into the border of the undifferentiated endodermal cell mass. When this cell mass splits to form gut endoderm and lateral mesoderm, the sex-cells proceed medially with either layer. By the time the gut is formed, these cells are lateral to it; they all eventually become located in the splanchnic mesoderm of this region. From here the sex-cells migrate dorsal to the hind gut, thence to the region ventral to the Wolffian ducts. Here they become surrounded by peritoneal cells which form the somatic portion of the gonads. From this position the germ gland anlagen are shifted back to their location dorsal to the gut.

There is very little multiplication of the sex-cells during the period of migration. Division apparently takes place in the extra-embryonic area, and is not renewed to any marked extent until after the sex-cells become located in the germ glands.

Migration is passive, being due to forces of growth which are altogether external to the cells themselves. These forces of growth are factors common to the development of the organs formed in the body of the teleost embryo.

These cells are transported from the edge of the embryonic region medially, to positions just beneath or within the endodermal cell mass, as the case may be. They are carried passively from one position to another by the same forces of growth which result

in concrescence or the bringing together the halves of the germ ring. The influence of this factor can scarcely be over emphasized. Although not outwardly as apparent as in earlier stages, these forces are nevertheless responsible for the flowing of the streams of embryonic material towards the future position of the organs which are to develop therefrom.

Evidence derived from this study of *Fundulus* is in harmony with the theory of early segregation of these primary sex-cells.