① MORPHOGENETIC MOVEMENTS:

The following of cells and cell layers in the developing embryo of an animal, which results in the formation of germ layers and organ primordia.

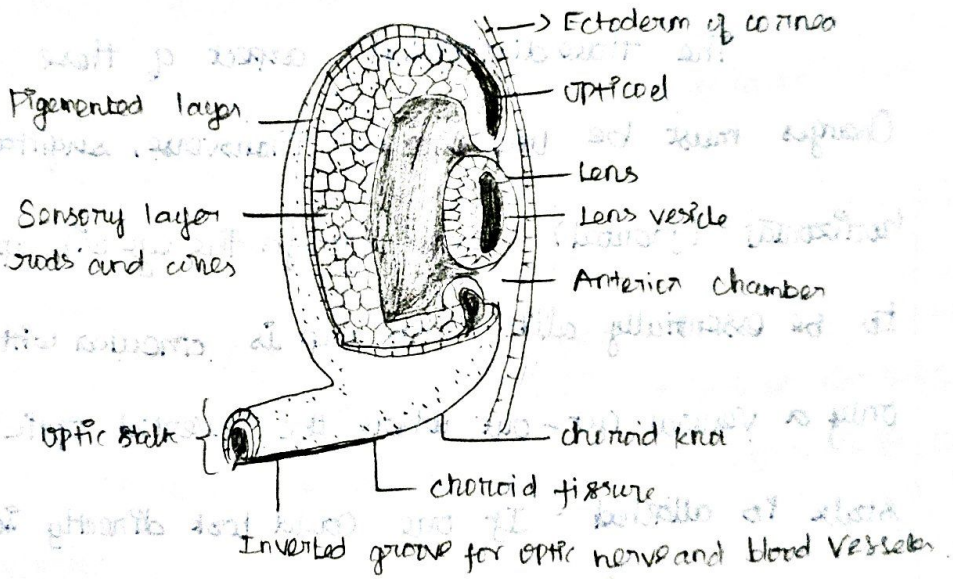
The most intensive morphogenetic movements occur during gastrulation, when part of the cellular material is shifted to the interior of the embryo, while the remaining cells form its surface. As a result, the material of the primordia of axial organs occupies a terminal position. Morphogenetic movement in almost all chordates has been studied by marking certain areas of the egg or blastula and tracing the subsequent fate of the marked areas.

Morphogenetic movements may involve the flow of cells and their layers over relatively long distance (for example, during invagination of the chordamesoderm in amphibians); they may also invoke changes in the shape of primordia remaining at the same site by the formation of folds and bends in the cell layer (for example, invagination of the wall of the optic vesicle and the division of the brain rudiment into the cerebral vesicles). The basis for morphogenetic movement lies in the capacity of cells to move and to form contacts with one another and with a substrate (adhesiveness). Cells of different types differ in their degrees of motility and adhesiveness, contacts between homogeneous cells are formed more readily than between cells of different types (elective affinity).

Reference: ① N. Arumugam (2013), Developmental biology Saras Publication, Nagarcoil.
② Samreen 6633 (2018). Developmental biology Net source.

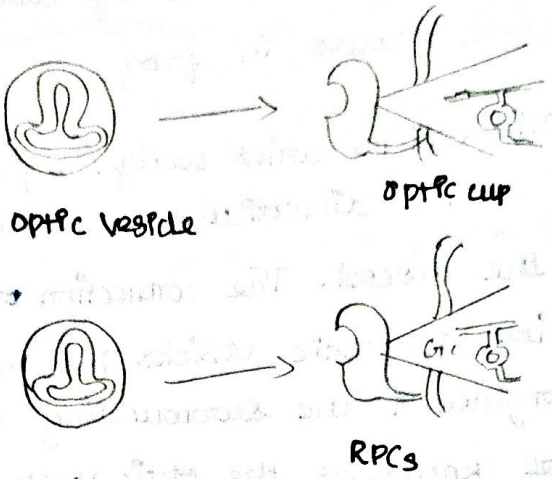
Optic cup formation in eye development Process in frog.

Optic vesicles arises early, by the tail-bud stage, as lateral diverticula from the ventro-lateral walls of the diocoel. The connection of the brain cavity with the optic vesicles becomes constricted, by the convergence of the surrounding mesenchyme, into a tube known as the optic stalk.



Developing eye parts of the frog.

The dorsal-lateral wall of the each optic vesicle comes into contact with the head ectoderm, as it expands laterally, and it is then flattened and finally invaginated. This invagination begins ventrolaterally and is continued obliquely medio-dorsally. This process of invagination is aided by a thickening of the vesicle wall between the dorsal and ventral limits. This is the region which will later form the retina.



The three dimensional aspect of these changes must be understood. Transverse, sagittal, or horizontal (frontal) sections through the eye will appear to be essentially alike. The cup is circular with only a ventral cut-out where the inverted optic stalk is attached. If one could look directly into such a developing eye, after removal of the lens, the impression would be of a horseshoe-shaped cup, the pupil of the eye, with a groove-like opening ventral.

Reference:

① N. Arumugam (2015), Developmental biology Saras publication, Nagarcoil.

② Ashok Bishnoi (2014), Developmental biology

Net source.

(15). Metamorphosis in insect.

The changes in form that occur as an insect approaches adulthood. When the immature insects and the adults are similar in appearance, the process is called simple metamorphosis, and the juvenile insects are called nymphs. When the immature insects and adults have different forms, the process is called complete metamorphosis, and the worm, or grub, like juvenile insects are called larvae. After the last larval instar, the insect changes into a pupa. In this stage, the insect does not feed or move around much. It may be covered by a protective cocoon. Eventually the insect molts for the last time and emerges as an adult.

Egg:

Most insects lay eggs in a location that offers some protection and food for the newly hatched juveniles. Many eggs are spherical, oval, or elongate, and some have elaborate sculptured shells.

Nymph:

The immature form of insects with simple metamorphosis (stages between molts of the exoskeleton are called instars).

Larva:

The immature form (between a egg and pupa) of insects with complete metamorphosis. (stages between molts of the exoskeleton are called instars).

Reference: ① N. Arumugam (2013), Developmental biology Saras Publication, Nagar coil.
② igna666 (2016), Developmental biology Net source.

③. In vitro fertilization:

In vitro fertilization (IVF) is a complex series of procedures used to help with fertility or prevent genetic problems and assist with the conception of a child.

During IVF, mature eggs are collected (retrieved) from ovaries and fertilized by sperm in a lab. Then the fertilized egg (embryo) or eggs (embryos) are transferred to a uterus. One full cycle of IVF takes about three weeks. Sometimes these steps are split into different parts and the process can take longer.

(IVF) is the most effective form of assisted reproductive technology. The procedure can be done using your own eggs and your partner's sperm. Or IVF may involve eggs, sperm or embryos from a known or anonymous donor. In some cases, a gestational carrier - a woman who has an embryo implanted in her uterus - might be used.

Your changes of having a healthy baby using IVF depend on many factors, such as your age and the cause of infertility. In addition, IVF can be time-consuming, expensive and invasive. If more than one embryo is transferred to your uterus, IVF can result in a pregnancy with more than one fetus (multiple pregnancy).

Reference: ①. N. Arumugam. (2013), Developmental biology Saras publication, Nagar coil.
② Nikhil vaishnav 3 (2019). Developmental biology. Net source.

Homeotic gene:

In evolutionary developmental biology, homeotic genes are genes which regulate the development of anatomical structures in various organisms such as echinoderms, insects, mammals, and plants. Homeotic genes often encode transcription factor proteins, and these proteins affect development by regulating downstream gene networks involved in body patterning.

Mutations in homeotic genes cause displayed body parts. (homeosis), such as antennae growing at the posterior of the fly instead of at the head. Mutations that lead to development of ectopic structures are usually lethal.

Types:

There are several subsets of homeotic genes. They include many of the Hox and paraHox genes that are important for segmentation. Hox genes are found in bilateral animals, including Drosophila (in which they were first discovered) and humans. Hox genes are a subset of the homeobox genes. The Hox genes are often conserved across species so some of the Hox genes of Drosophila are homologous to those in humans. In general, Hox genes play a role of regulating expression of genes as well as aiding in development and assignment of specific structures during embryonic growth. This can range from segmentation in Drosophila

Reference: ① N. Arumugam (2013). Developmental biology. Saras publication, Nagarcoil.
② Priyam Nath 1 (2018). Net source.

ICSI - Intracytoplasmic sperm injection:

Intracytoplasmic sperm injection (ICSI) is an in vitro fertilization (IVF) procedure in which a single sperm cell is injected directly into the cytoplasm of an egg. This technique is used in order to prepare the gametes for the obtention of embryos that may be transferred to a maternal uterus. With this method, the acrosome reaction is skipped.

There are several differences within classic IVF and ICSI. However, the steps to be followed before and after insemination are the same. In terms of insemination, ICSI needs one only sperm cell per oocyte, meanwhile IVF needs 50,000 - 100,000. This is because the acrosome reaction has to take place and thousands of sperm cells have to be involved in IVF. Once fertilized, the egg transformed into a proembryo and it has to be transfered to the uterus to continue its development.

The first human pregnancy generated by ICSI was carried out in 1991 by Gianpiero Palermo and his team.

This procedure is most commonly used to overcome male infertility problems, although it may also be used where eggs cannot easily be penetrated by sperm, and occasionally in addition to sperm donation.

It can be used in teratozoospermia, because once the egg is fertilized, abnormal sperm morphology does not appear to influence blastocyst development or blastocyst morphology. Even with severe teratozoospermia, microscopy can still detect the few sperm cells that have a "normal" morphology, allowing for optimal success rate.

It can also be used in Azoospermia, "Vulvus Spermatozoa" (from Fertility preservation after cancer, or because of a fertilization failure after IVF).

Reference: ① N. Arumugam (2013), Developmental biology. Saras publication, Nagarcoil.

② Kaizo Takumi (2017), Developmental biology. Net source.