VISION IN INSECTS

Visual receptors in insects are of two types- compound eyes and simple eyes or ocelli. Compound eyes are mainly found in insects which are made up of ommatidia. They are responsible for mosaic vision forming apposition or superposition images.

COMPUND EYES

STRUCTURE OF COMPUND EYES IN INSECTS:

Insects have one pair of black and hemispherical eyes mounted on a short, movable and joined stalk.

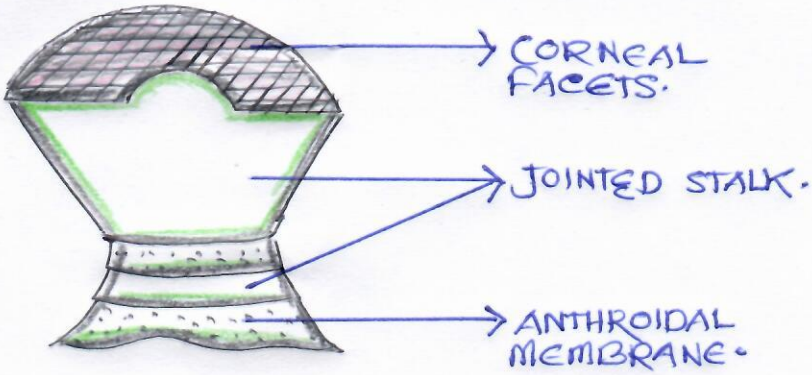

Fig: general appearance of a compound eye.

Each eye is made up of a large number of independent visual elements or units called OMMATIDIA. Such eyes are called compound eyes. These are characteristic of the phylum Arthropoda and do not occur elsewhere in the animal kingdom.

All the ommatidia about 2500 are arranged radially and are similar in structure, each consist of many cells arranged along its central axis. Their description is as follows:

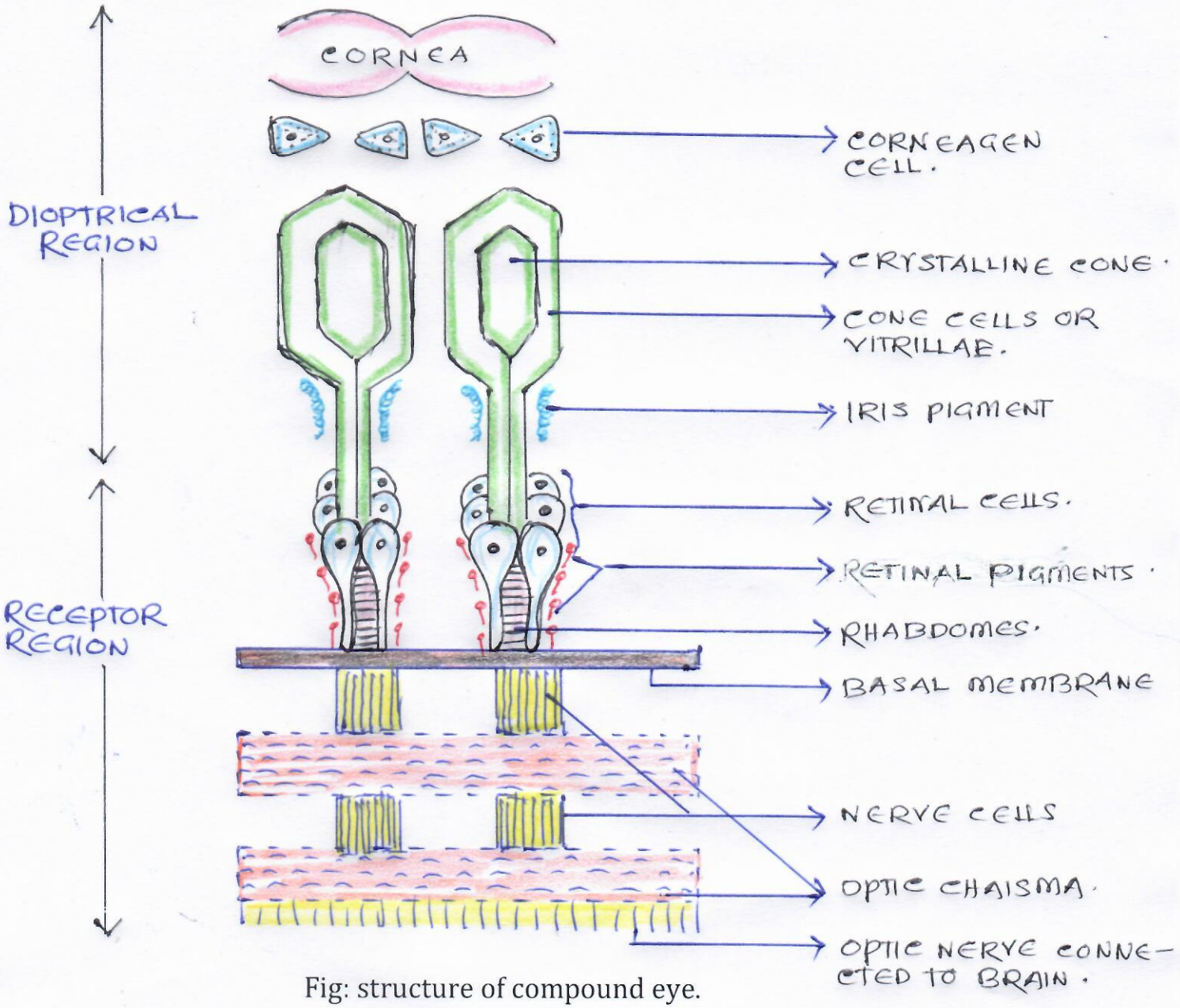

Fig: structure of compound eye.

CORNEA:

Transparent cuticle cornea exhibits a large number of square or facets giving the appearance of a graph paper.

CORNEAGEN CELLS:

Modified epidermal cells and secrete a new cornea as soon as the old one is caste off in mounting.

CONE CELLS:

Four elongated cone cells or vitrillae focus light upon the inner sensitive parts or receptor region of eye.

RHANDOME AND RENTIAL CELL:

Rhabdom is secreted and surrounded by a group of seven elongated retinal cells.

CHROMATOPHORES:

IRIS PIGMENT: lying along the cone cell.

RETINAL PIGMENT: inner series separating the rhabdoms.

These amoeboid pigments take up different positions according to the variation in the intensity of light.

MOSAIC VISION:

Each ommatidia is capable of producing a separate image of a small part of the object. All the ommatidia together produce the whole image of the object. Therefore, vision effected is said to be mosaic vision because of its similarity to mosaic work. Moving objects thus can be detected.Mounted on the movable stalk, it can move on the head in much of the same manner as the antenna of a radar.

Mosaic vision is deficient in focusing ability and clarity of image. But such an eye is efficient for picking up motion and peripheral vision.The nature of composite image formed varies according to different intensities of light. Thus, two types of images are formed as follows:

1). APPOSITION IMAGE: e.g. Butterflies. This image occurs in bright light i.e. during day time

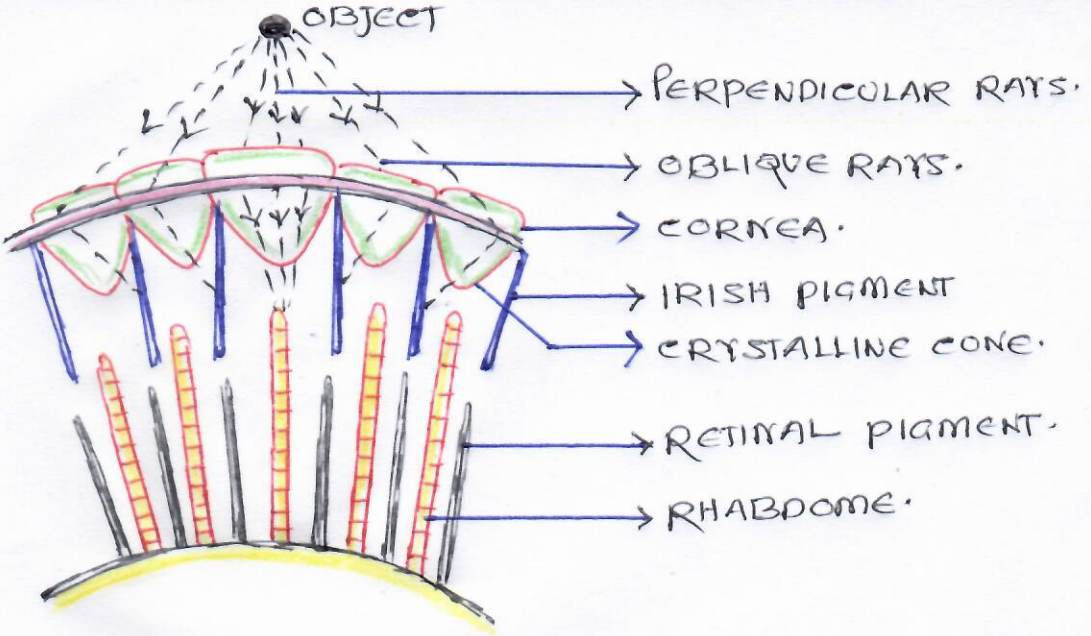

Fig: apposition image.

The image formed by this type of eye is never very good. It functions best at very short distances only. Thus, most Arthropoda are always short sighted. Butterfliesare night blinded and the eyes are permanently set in this condition and are suited to see only in day light.

2. SUPERPOSITION IMAGE: - e.g. moths. It is formed during night in dim night.

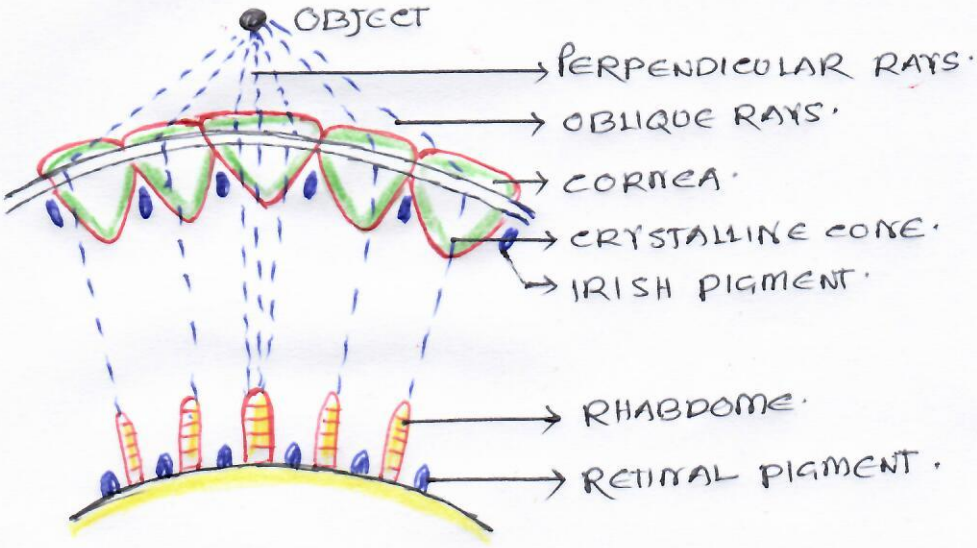

Fig: superposition image.

Image formed is not sharp but the animal gets some sort of ideas of the objects moving about in surrounding.In some insects, like moths and fireflies, eyes are permanently set like this so that they are well adapted to see at night but are day blind.

The prawns like most arthropods, seems to adjust their eyes to form both types of images according to the prevailing intensive of light.

The optic nerve carries the impulse to the brain, where they are interpreted and registered as an upright mental image.

SIMPLE EYE OR OCELLI:

At the base of each antenna is a fenestra which represents a simple eye or ocelli.Each comprises a single corneal facet. It is mainly concerned with light collecting rather than image forming. Probably it enhances the sensitivity of compound eyes.

Thus, emergence of eyes or compound eyes in Arthropoda in general and insects in particular resulted in better vision and optimal utilization of surrounding leading to effective dispersion, diversification and successful continuity of the groups.