

eye. The size of the facets situated at the centre may differ from those situated dorsally or ventrally (*Apis* and *Anax*).

**1. The Ommatidium** (Fig. 13.3). Each ommatidium, despite its size and secondary modifications in different species of insects, consists of a dioptric or optical apparatus receiving the light, and a sensory or retina forming the image.

The optical apparatus is composed of a cuticular lens and a cone. The sensory part is composed of elongated specialized nerve cells, called the retinula cells. They form a rhabdom at the centre or axis of ommatidium. The retinula cells are surrounded by the secondary pigment cells, while cone is surrounded by the primary pigment cells. The retina is separated at the bottom by a basement membrane through which the axons arising from the retinula cells and pass into the optic lobes.

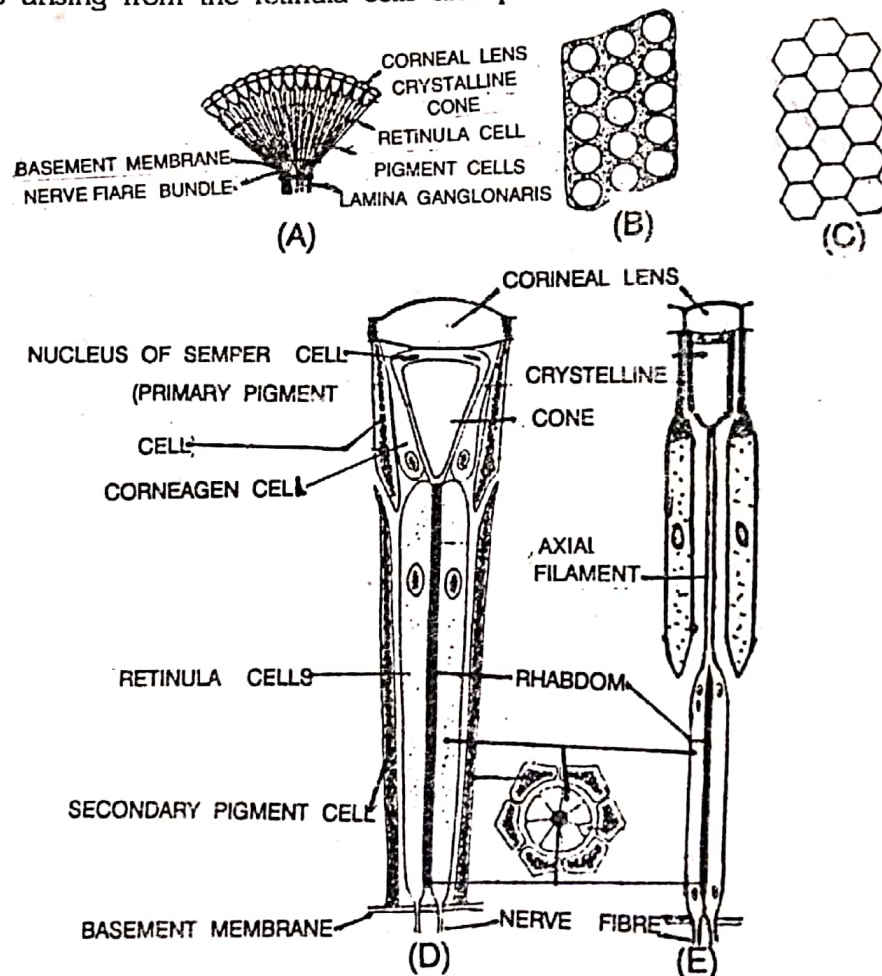


Fig. 13.3 The compound eye : (A) diagrammatic representation of ommatidial arrangement, (B) surface view of an eye of aphid showing the spherical facets separated from each other, (C) surface view of the eye of a generalised insect showing the hexagonal ommatidia closely packed together, (D) structure of a typical apposition and (E) superposition ommatidia. (inset - cross section).

**(a) Types of Ommatidia** (Fig. 13.4). On the basis of modifications of cone the ommatidia are recognized into four types; eucone, pseudocone, acone and exocone.

**(i) The Eucone Ommatidia.** They contain a true crystalline cone as a hard, refractive body formed from an intercellular secretion of the cone cells or Semper cells; e.g., Orthoptera, Odonata, Ephemeroptera, Trichoptera, Lepidoptera, Hymenoptera, some Hemiptera and Coleoptera, Thysanura

(ii) **The Pseudocone Ommatidia.** They do not contain true crystalline cone but all cone cells are filled with gelatinous semi-liquid substance; e.g., Dermaptera, Hemiptera, Nematocera, Diptera and Coccinellidae, Curculionidae (Coleoptera).

(iii) **The Accone Ommatidia :** They do not contain either a crystalline or liquid cone but the cone cells are elongated and transparent; e.g., Dermaptera, Hemiptera, Nematocera, Diptera and Coccinellidae, Curculionidae (Coleoptera).

(iv) **The Exocone Ommatidia :** They have an extracellular cuticular cone in the place of crystalline or liquid cone secreted by the cone cells. It is formed as an ingrowth from the inner surface of corneal facet in front of the unmodified cone cells. It is refractile in nature; e.g., Lampyridae, Elateridae, Dermestidae and Cantharidae etc., of Coleoptera.

Similarly on the basis of rhabdom, the eyes can be classified into two types:

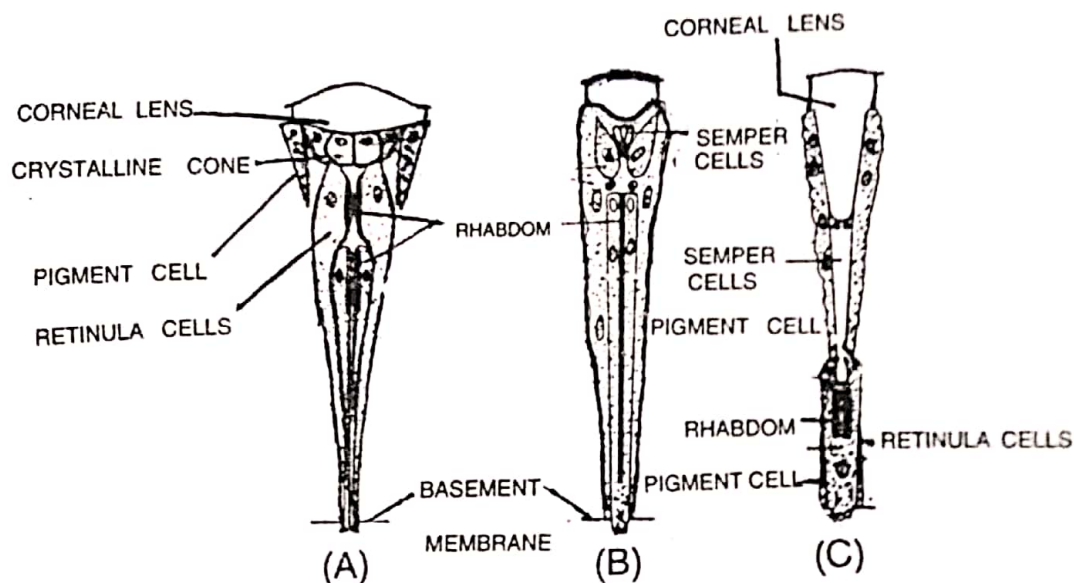


Fig. 13. 4. Types of ommatidia found in - (A) *Lepisma*, (B) *Trichodes*, and (C) *Lampyrus* (after Eltringham, 1933).

(i) **Apposition Eyes.** These contain the rhabdom which is very long and extending from the lens to the basement membrane; e.g., cockroach.

(ii) **Superposition Eyes.** These bear a comparatively short rhabdom. It lies far behind from the lens to which it is connected by an axial filament; e.g., Coleoptera and nocturnal Lepidoptera.

(b) **Structure of the Ommatidium.** As described above, the ommatidium consists of the cornea, a corneagen layer, the cone or Semper cells, the primary and secondary iris cells and the retinula cells.

(i) **The Cornea.** It is outermost part of the ommatidium. It is transparent, colourless and biconvex modified cuticular area often termed as a facet or lens. It is cast off at each ecdysis and resecreted by the epidermal corneagen cells.

(ii) **The Corneagen Cells.** They are the epidermal or hypodermal cells lying behind the cornea. A group of two corneagen cells secrete a single lens. After formation of the lens, they withdraw peripherally and modify into the primary iris cells.

(iii) **The Cone or Semper Cells.** Beneath the corneagen layer or cornea, there