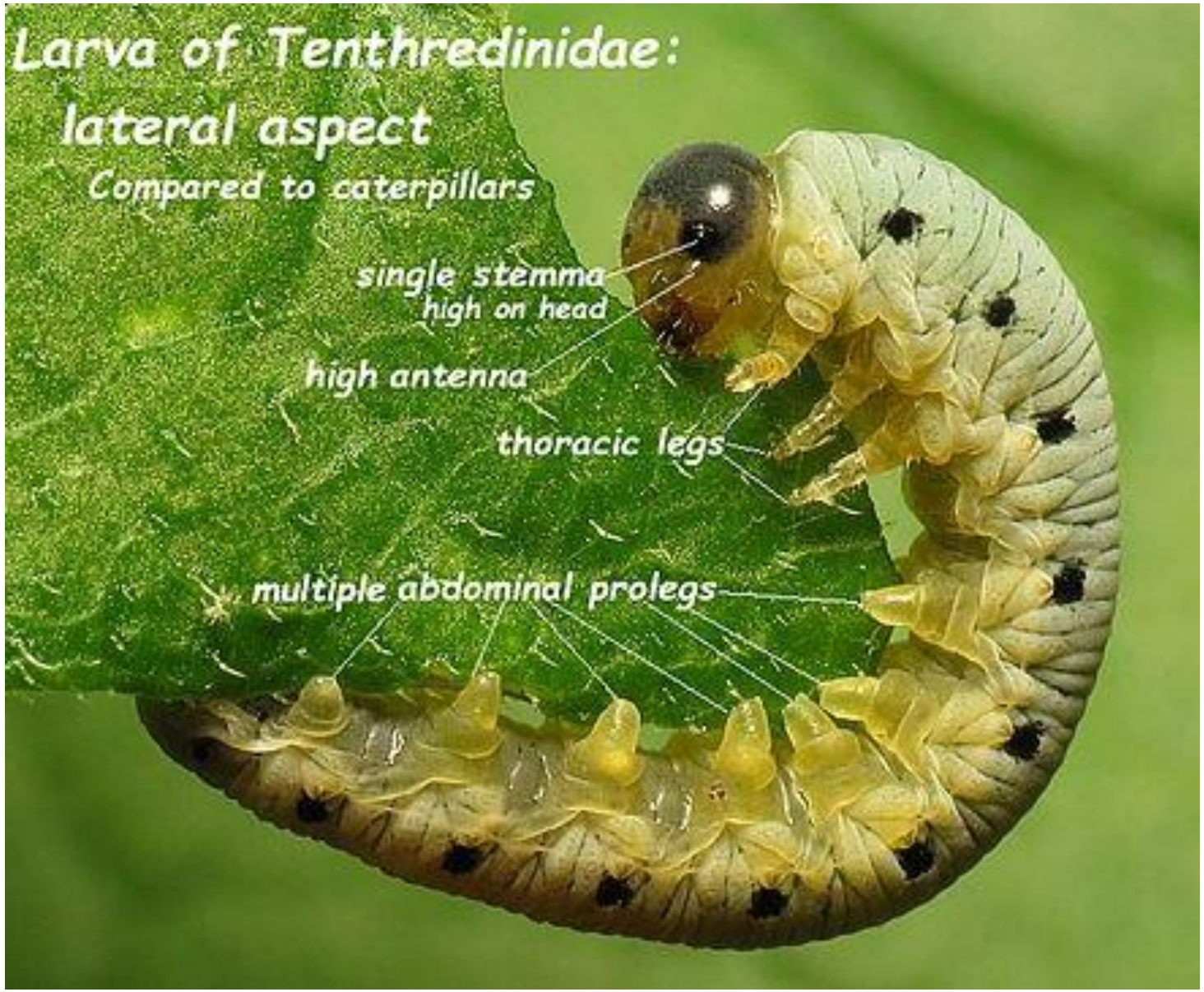
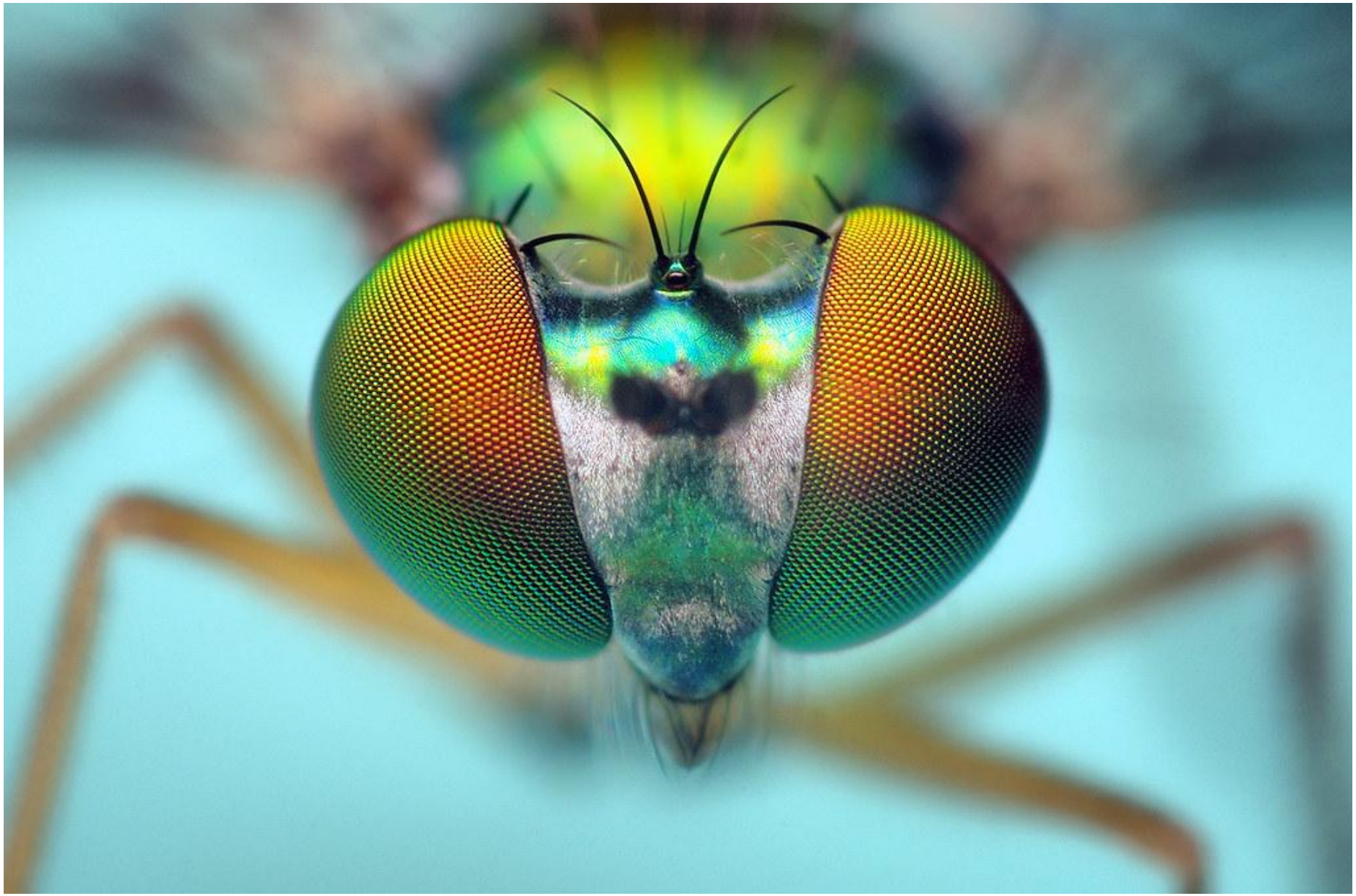
Visual Organ in Arthropoda


Larva of Tenthredinidae:
lateral aspect
Compared to caterpillars
single stemma
high on head
high antenna
thoracic legs
multiple abdominal prolegs



SIMPLE EYES

1. OCELLI


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image.

The ocellus bears a single lens and in most of the insects it is cuticular in origin but in Ephemeroptera it is formed from the underlying cells (corneagen cells) rather than cuticle. In *Machilis* and *Periplaneta* a simple transparent cuticle is present in the place of a thickened lens. Beneath the lens is present the epidermis which is composed of transparent colourless small cells often called the corneagen cells. Beneath the layer of corneagen cells are arranged large number of comparatively larger cells, the nerve cells, called the sense or retinula cells, forming the retina. Some of the retinula cells may extend from cornea to the base of ocellus. The retinula cells are arranged in a group of four cells each and the rhabdomeres of them form a rhabdom. They may contain pigment. The fibres of the retinula cells run backward and merge in the ocellar nerve which terminates into the mid-dorsal region of the pars intercerebralis of the brain. They synapse with the neurons of the region.

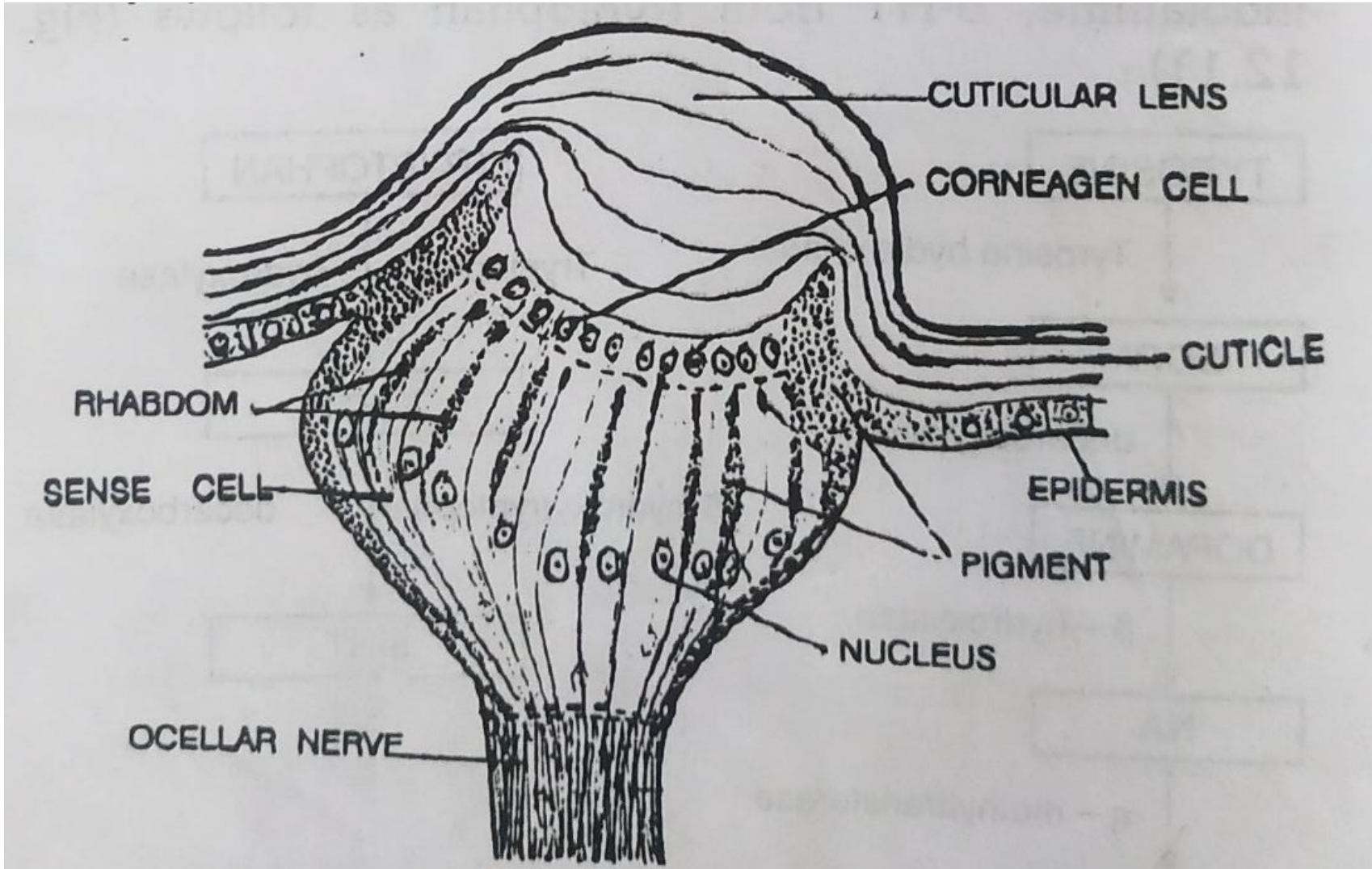
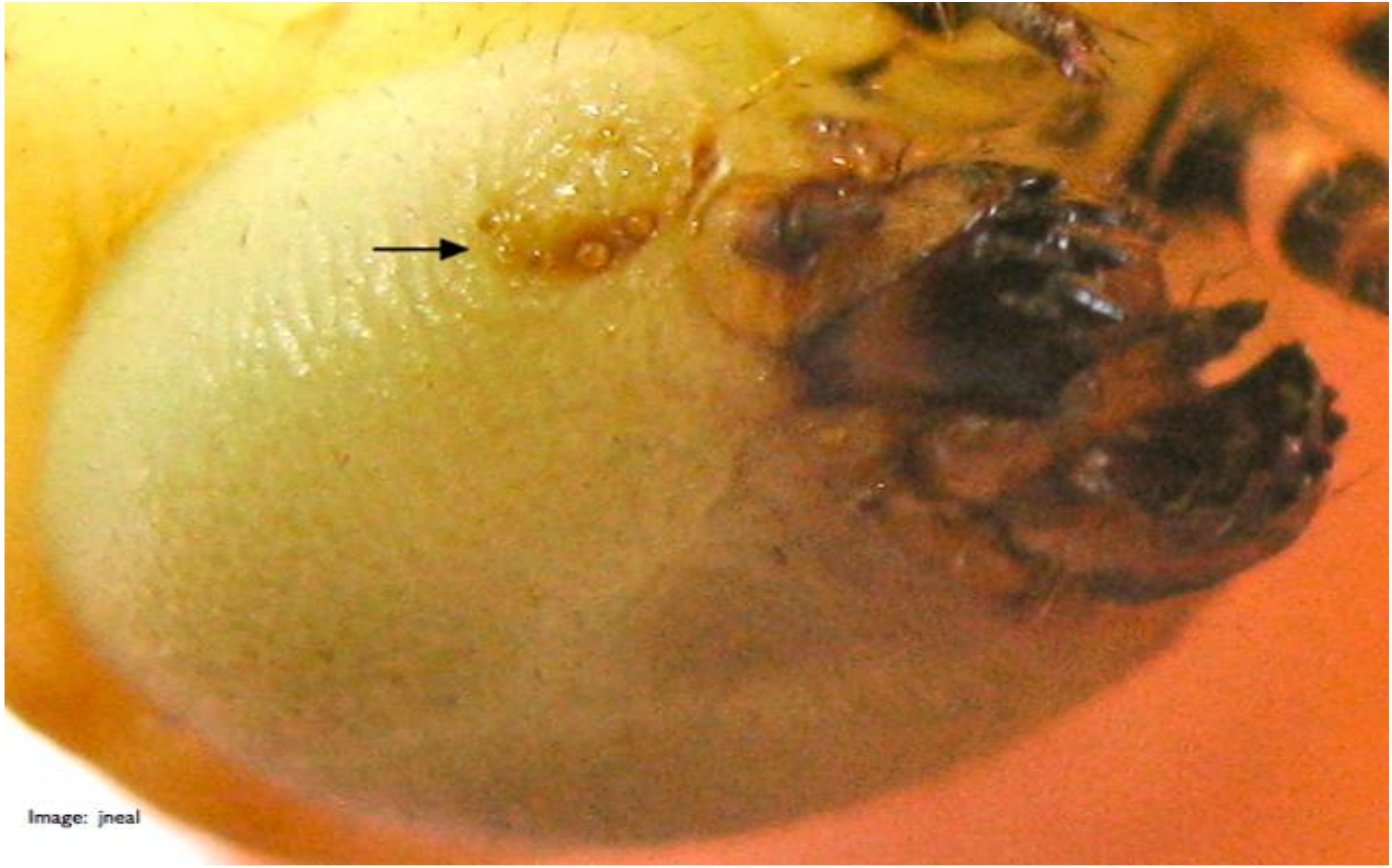


FIG. 13.1. The dorsal ocellus (after Imms, 1957).

2. Functions. The ocelli are simple light sensitive or stimulatory organs activating immediately the central nervous system and thus play a key role in maintaining the diurnal rhythm.

They are well adapted for quick perception of light, changing in its intensity. They are, however, mostly incapable of forming images because of wide angular separation of their rhabdoms and as a result the images are focused far behind the retina.

2. LATERAL EYES
Or
STEMMATA



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B. THE STEMMATA

The lateral eyes of the holometabolous larvae and some adult insects (Collembola, Lepismatidae, Siphonaptera, Anoplura, Strepsiptera) are more developed than the dorsal ocelli but less than the compound eyes, and are commonly called as the lateral simple eyes or stemmata. Some workers consider them as the precursors while others as the degenerated forms of the compound eyes.

The stemmata vary in number from a single pair (tenthredinid larvae) to the six pairs (lepidopterous larvae) amongst holometabolous immature forms. The adult insects, often bear a single pair of stemmata on the head.

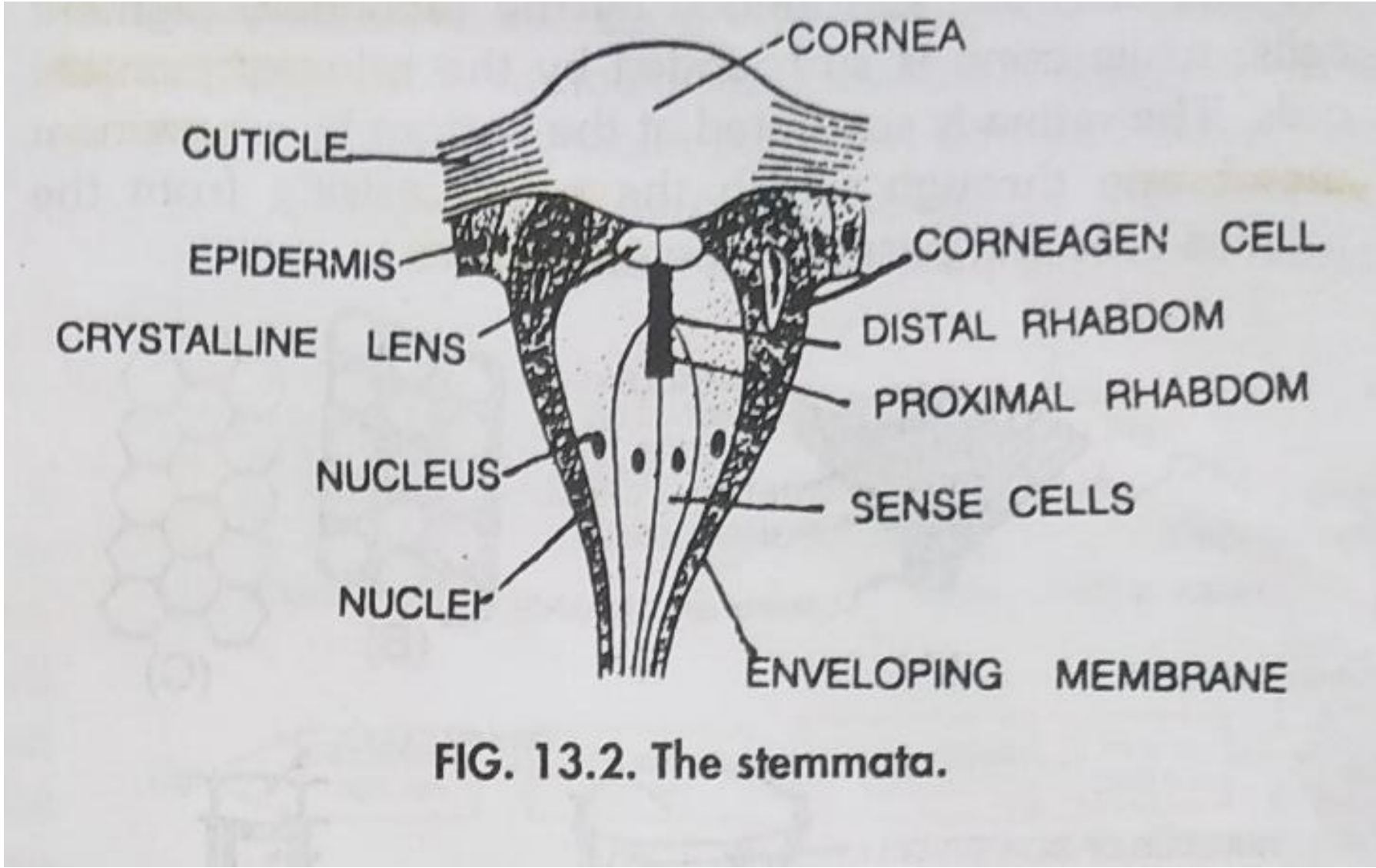

FIG. 13.2. The stemmata.

1. Structure (Fig. 13.2). : Each stemmata is formed from a small group of photoreceptive structures (maximum number exceeds 50 in *Xenos rossi* (Strepsiptera) resembling the ommatidia of a compound eye.

Each photoreceptive structural unit of stemmata (ommatidium) consists of; (*a*) an external endocuticular cornea; (*b*) crystalline lens (it is lacking in that of tenthredinid larvae); (*c*) a group of seven retinal cells; and (*d*) some corneagen cells.

The retinal cells differentiate retina into two parts – distal retina composed of 3 cells forming a distal rhabdom and proximal retina composed of 4 cells forming a proximal rhabdom. All retinal cells are externally covered by an inner membrane and an outer layer of large corneagen cells. The nerve fibres of retinal cells enter the optic lobes or lateral part of the brain.

In adult insects, each stemmata is composed of eucone type of such structures, 8 in Collembola, 12 in Lepismatidae, while 50 in some Strepsiptera. The photoreceptive organs of muscoid maggots, are according to some workers, formed due to degeneration of the stemmata.

2. Functions. Stemmata can form immages on the rhabdoms. The images are formed on the proximal rhabdom when the object is closer within the distance of 0.08 mm and are formed on the distal rhabdom when the object is at long distance. They can differentiate the shapes and colours of the object. The caterpillars form mosaic images.

Reference:

- Modern Entomology, DB Tembhare
- Internet