Structures and mechanisms of light adaptation in the dorsal and the ventral eye of *Ascalaphus macaronius*.

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The double compound eye of *Libelloides (Ascalaphus) macaronius* is a superposition eye of eucone type. The eye is divided into two parts, the larger dorso-frontal part consisting of approximately 5000 ommatidia and the smaller ventro-lateral part with a similar number of ommatidia.
Field experiments and observations of animal behaviour indicate that the dorsal eye is involved in regulation of flight and hunting activities in an enviroment with a high intensity of UV light accompanied by high temperature, whereas in the morning and evening, in the conditions of low light intensities and low environmental temperature when the animal is not able to escape by flight, the ventral eye provokes a behaviour consisting of turning around a grass stalk, thus exposing the smallest silhouette.
We suppose that the different strategies of eye functions are reflected in the structure and the mechanisms of light adaptation.

It is known that in the eye of *Ascalaphus* some kind of pupil mechanism is present regulating the light flux into the eye in changing light conditions (Nilsson et al. 1992, Stušek and Hamdorf 1998, Stušek et al, personal communication).

Based on our microscopical and molecular data about the ommatidia of dorso-frontal as well as of the ventro-lateral part of *Ascalaphus* eye we suppose a pupil mechanism located at the tip of crystalline cone. Our analyses of morphological data indicate that the pupil is formed as a functional unit, composed of the crystalline cone, the primary and the secondary pigment cells in conjunction with the most distal part of the seven retinula cells (cells 1-6 and cell 7). We gathered evidence that the closing mechanism of the functional diaphragm is operated mainly by the retinula cells. There is a very important difference between the two part of the eye, observed already by Ast (1920) and Schneider et al (1977) concerning the arrangement of retinula cells around the tip of the crystalline cone. In the dorso-frontal eye fibres, few microns in diameter combined of distal branches of retinula cells are attached to the tip of the crystalline cone, in the ventro-lateral eye a connection to the crystalline cone is made of the distal part of retinula cells forming a funnel like attachment.

In the dorso-frontal eye of *Ascalaphus*, during light adaptation, the most distal parts of retinula cells contract and in turn, the pigment cells move towards the tip of the crystalline cone. The expansion of the apical portion of the retinula cells should lead to reverse process and pupil opening. We have not detected massive pigment migrations in the secondary pigment cells toward the proximal part of ommatidium
In the ventro-lateral eye of *Ascalaphus*, during light adaptation, the translocation of cellular elements around the tip of crystalline cone is more extensive. In light adapted eye, retinula cells and the pigment granules in the secondary pigment cells are shifted in the proximal direction. Thus, the retinula cells funnel contact a small part on the tip of the crystalline cone. The connection of retinula cells and the proximal part of crystalline cone is completely surrounded by a collar of the primary pigment cells. In the dark adapted eye, a shift in the opposite direction was observed. Whenever pigment granules in the secondary pigment cells migrate in distal direction, the pigment granules in the primary pigment cells also migrate in the same direction, leaving a thin layer of cells without pigment around the tip of the crystalline cone. The shift of the pigments is followed by an expansion of retinula cells in the distal direction where extensions of retinula cells enter into the space between the primary and the secondary pigment cells, surrounding the latter from the outside.
In the last set of experiments, we have analysed the presence and location of cytoskeletal elements as well regulatory proteins which presumably participate in these motile processes.

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