Resilin in the Lens Cuticle of the Firefly, *Photinus pyralis* Linnaeus

Resilin is a structural elastic protein whose name is derived from the Latin *resilire*, to jump back. It has been reported as a major constituent of certain elastic hinges of the insects, *Aeshna cyanea*, *Periplaneta americana*, *Schistocerca gregaria*, elastic tendons in the cuticle of *A. cyanea*, *Calliphora erythrocephala*, *S. gregaria*, abdominal spring of *Oryctes rhinoceros* and *Melolontha vulgaris*[1], mesosternal cuticle of *Melanotus communis*[2] and hinge between merus and ischium in cephalothoracic leg of the crustacean, *Astacus fluviatilis*[1].

Based on the fact that resilin is colourless, ANDERSEN and WEIS-FOGH[1] suggested in 1964 that resilin, may also play an optical role in the lens cuticle of insects. Since then, there seems to be no report in favour of their suggestion. Observations which have been made recently on the lens cuticle of compound eyes of the firefly, *Photinus pyralis* Linnaeus, indicate the presence of resilin in it lending support to their suggestion.

The lens cuticle, like the cuticle of many other insects, is composed of an outer epi- and inner procuticle. The latter comprises an outer colourless 'hyaline' exocuticle (corneal lens), the inner border of which is elongated into a number of conical processes (processes of corneal lens) (Figure 1) corresponding to the mesocuticle of other insects with regard to staining and histochemical reactions. However, aniline blue-positive endocuticle which is present in many insect cuticles and other arthropods, is absent in the lens cuticle. Although larger portions of the corneal lens are reluctant to histochemical stains customarily used in arthropod cuticular study (such as Mallory's triple, Masson's trichrome and Heidenhain's iron haematoxylin), they stain deep sapphire with toluidine blue-light green combination at pH 4–7. They also swell considerably in phenol, formamide, formic acid, lithium thiocyanate and cupric ethylenediamine.

Chromatographic analysis for amino acids of the lens cuticle following the method of BAILEY and WEIS-FOGH[3] and ANDERSEN[4] showed the presence of 2 fluorescent amino acids (*di*- and *tri*-tyrosine) at Rf 0.05 and 0.18 besides the usual amino-acid constituents of insect cuticle. The fluorescence of these 2 amino acids increased when the chromatogram was exposed to ammonia vapour, whereas vapour from hydrochloric acid quenched it almost completely. Examination of the frozen sections of the lens cuticle with the fluorescence microscope (Carl Zeiss) showed that at neutral pH the entire width of the 'hyaline' exocuticle (corneal lens) fluoresced blue with a maximum intensity at about 420 nm (Figure 2). In alkali media it fluoresced a brighter blue.

Fig. 2. Transverse section through the lens cuticle of *Photinus* photographed in UV-light.

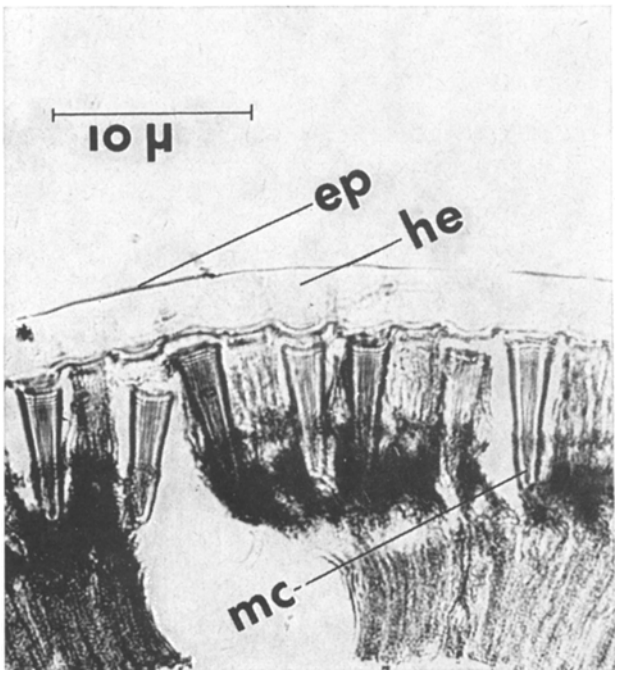

Fig. 1. Transverse section through the lens cuticle of *Photinus* stained after Mallory's triple stain, ep, epicuticle; he, hyaline exocuticle (corneal lens); mc, mesocuticle (process of corneal lens).

The foregoing observations provide unequivocal evidence for the presence of resilin in the lens cuticle of the firefly *Photinus*, the significance of which will be more elaborately reported in due course.

Résumé. C'est la première fois que de la résiline a été identifiée dans la cornée de *Photinus pyralis* Linnaeus.

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