SEM Examination for the Antenna of *Apis mellifera* (Hymenoptera: Apidae)

Assist. Prof. Dr. Muhsin Alghezzi

- **Could bees revolutionize medicine as we know it?**

- **What if we could use insects' extraordinary sense of smell to prevent and diagnose illnesses?**

- Scientific research has demonstrated that bees have an extraordinarily acute sense of smell and can be trained to perform health checks by detecting a specific odour in peoples' breath.
- The project consists in a series of alternative diagnostic tools that use bees to diagnose accurately at an early stage of a vast variety of diseases.

- **What can bees detect?**
- Scientific research demonstrated that bees can diagnose accurately at an early stage a vast variety of diseases, such as: tuberculosis, lung and skin cancer, and diabetes.
- http://www.susanasoares.com/uploads/pics/03-b-precise-object-b.jpg

- **The number and distribution and the morphology of the various receptors on the honey bee antenna *Apis mellifera* are described, using histological techniques and scanning electron microscopy SEM.**
- **Receptors described include sensilla trichodea, sensilla basiconicum, sensilla coeloconica, sensilla ampulaceum , sensilla campaniformium and sensilla placodeum.**

- **Honey bees use their antennae to detect odor.**

- **The honey bee's sense of smell is so sensitive that it can detect the trace of a scent in flight.**

- **Once the scent is detected on the antennae, the bee's hyper-sensitive olfactory path processes the information, enabling the bee to determine the relevance of the scent to her search for pollen.**

External morphology of the honey bee antenna.

- The honey bee antenna was examined by scanning electron microscopy with different magnifications. Two proximal antennal segments (scape and pedicel) and the ten segments of the flagellum are indicated by arrows in A

Olfactory Antennae

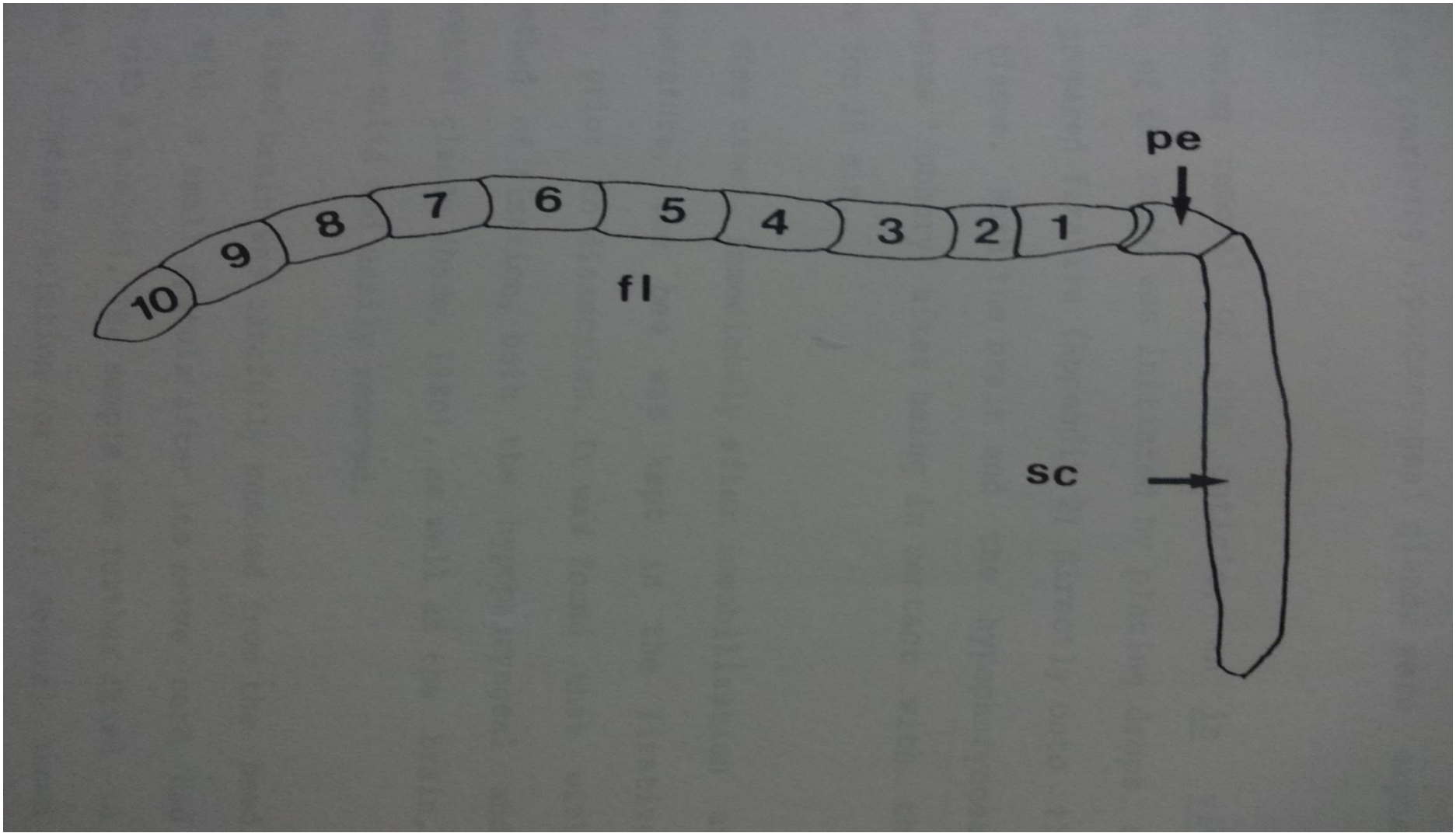
- Honey bees use their antennae to detect odor.
- Honey bees have 170 odor receptors, or chemoreceptors, in their antennae.
- This is high for an insect -- fruit flies (Drosophila) have 62 receptors and mosquitos (Anopheles e) have 79.

Olfactory Antennae

- **The honey bee's sense of smell is so sensitive that it can detect the trace of a scent in flight. Once the scent is detected on the antennae, the bee's hyper-sensitive olfactory path processes the information, enabling the bee to determine the relevance of the scent to her search for pollen**.

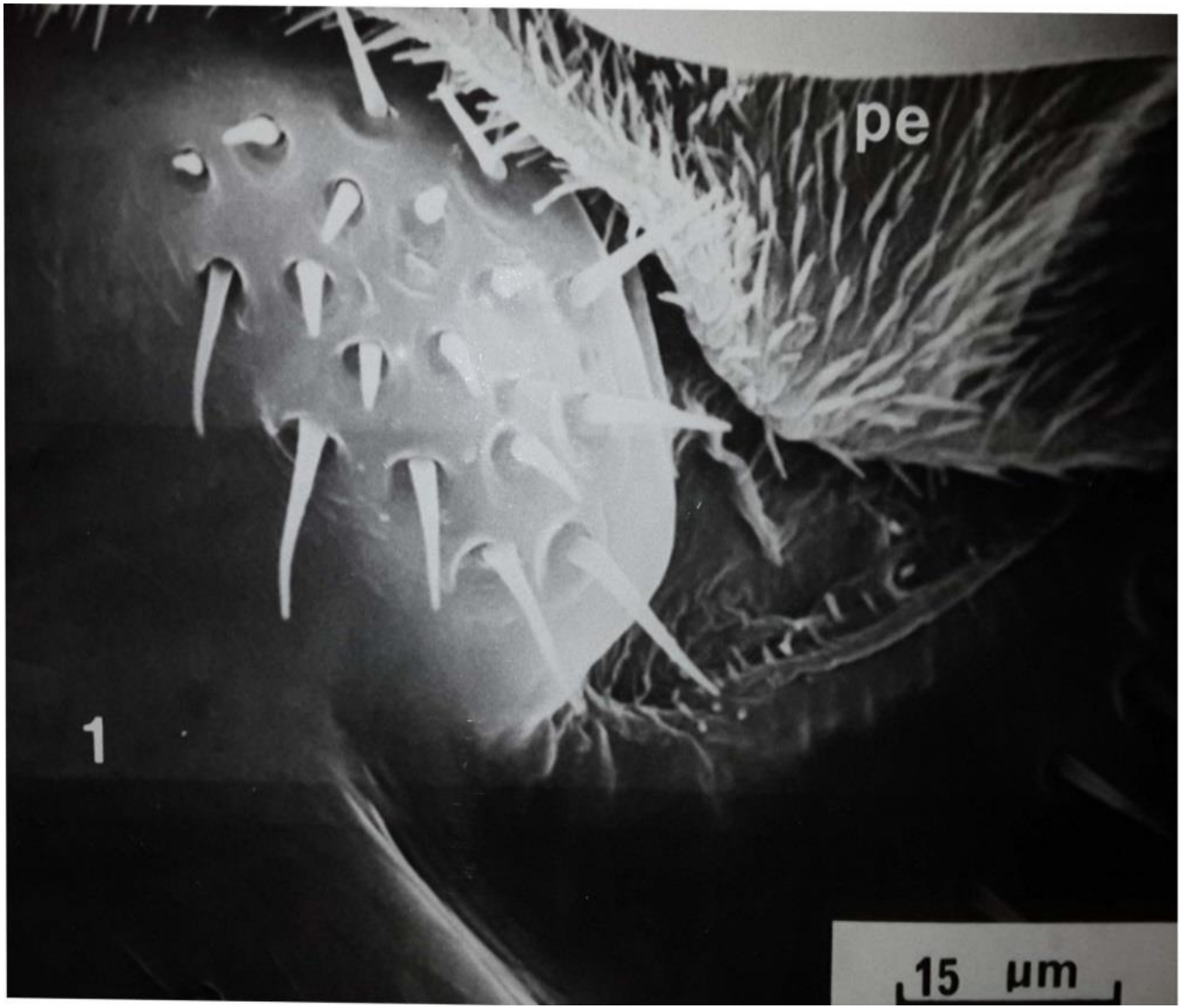
HEAD OF HONEY BEE

The segments of the worker antenna : sc, scape; pe, pedicel ; 1-10 flagellar segments , f1.

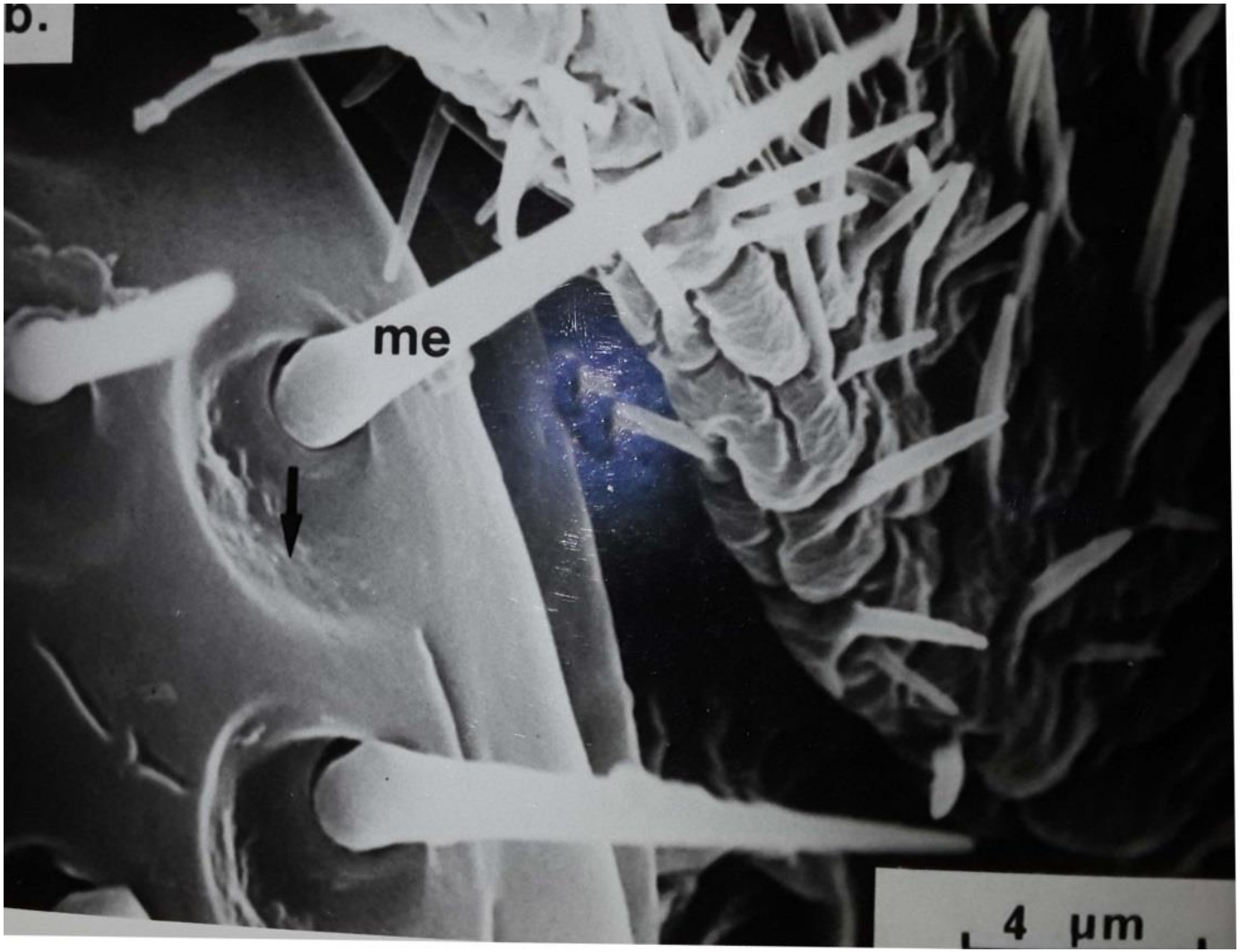


antenna basis (enlargement)

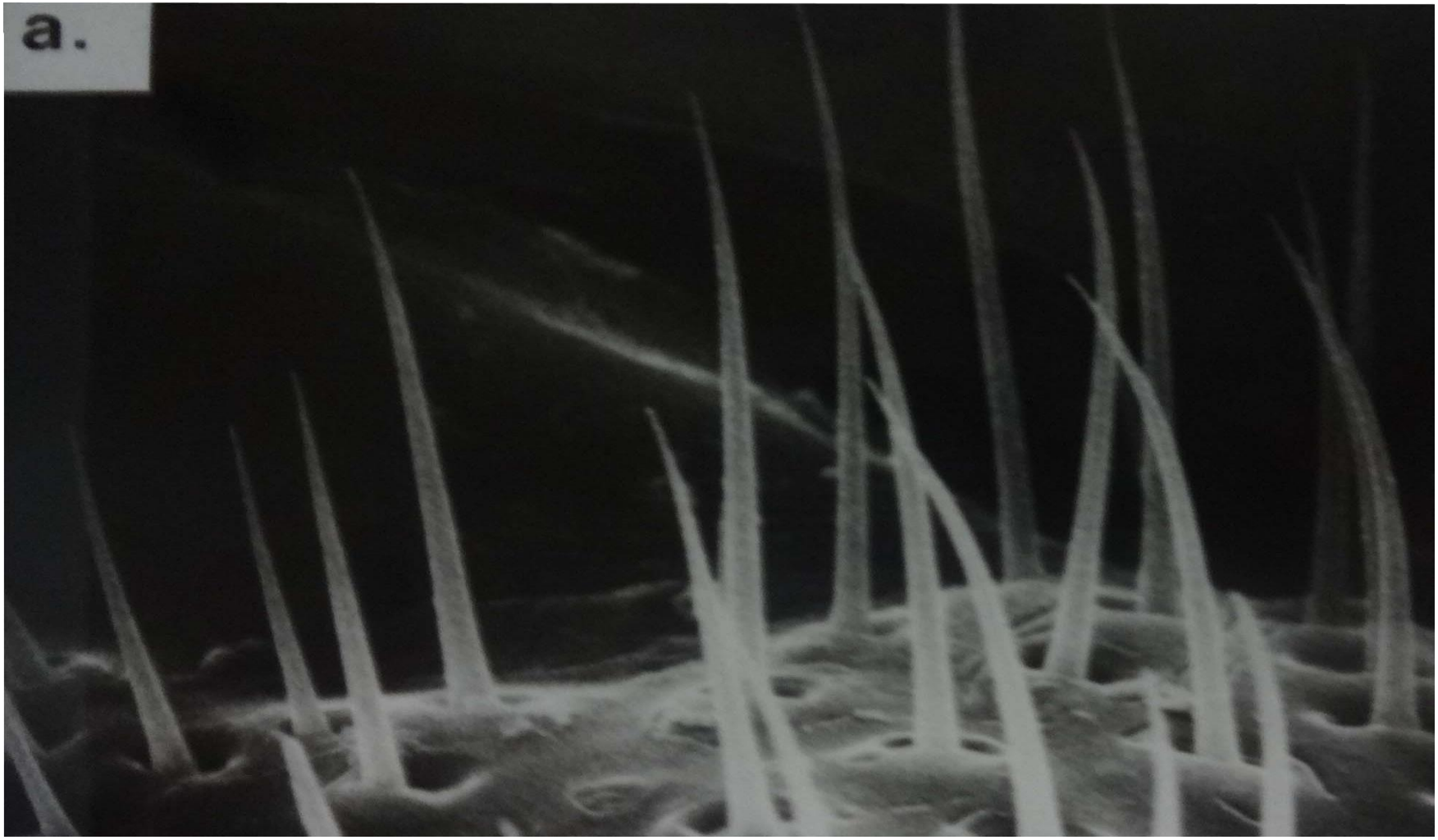
Johnston’s organ at the base of the worker antenna .a low , b high magnification; arrow, preferred direction of bending; me, mechanoreceptor; pe, pedicel; 1, flagellar segment no.1.



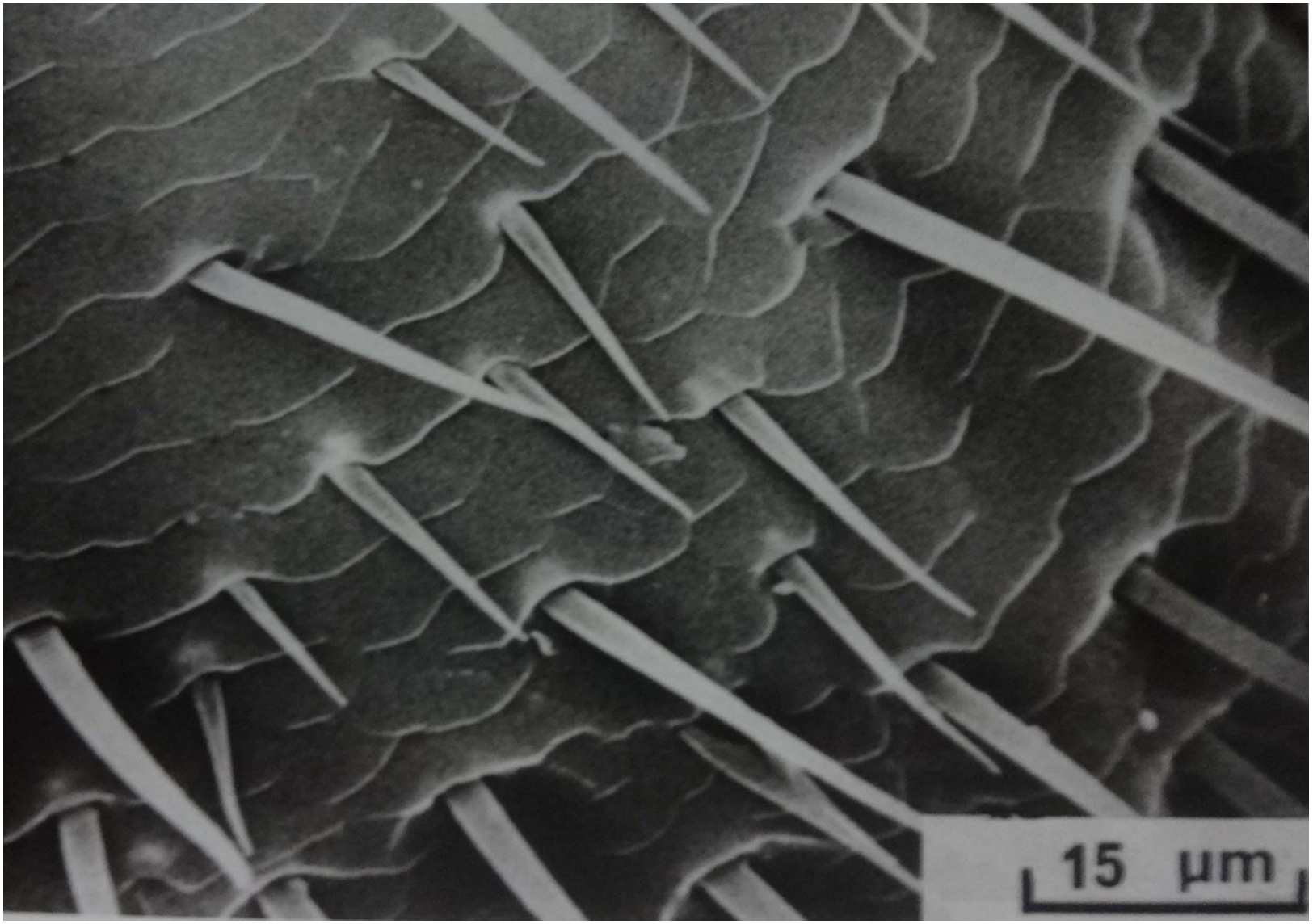
Johnston’s organ at the base of the worker antenna. A low, b high magnification; arrow, preferred direction of bending; me, mechanoreceptor; pe, pedicel; 1, flagellar segment no.1.



Mechanoreceptors of the scape proximal

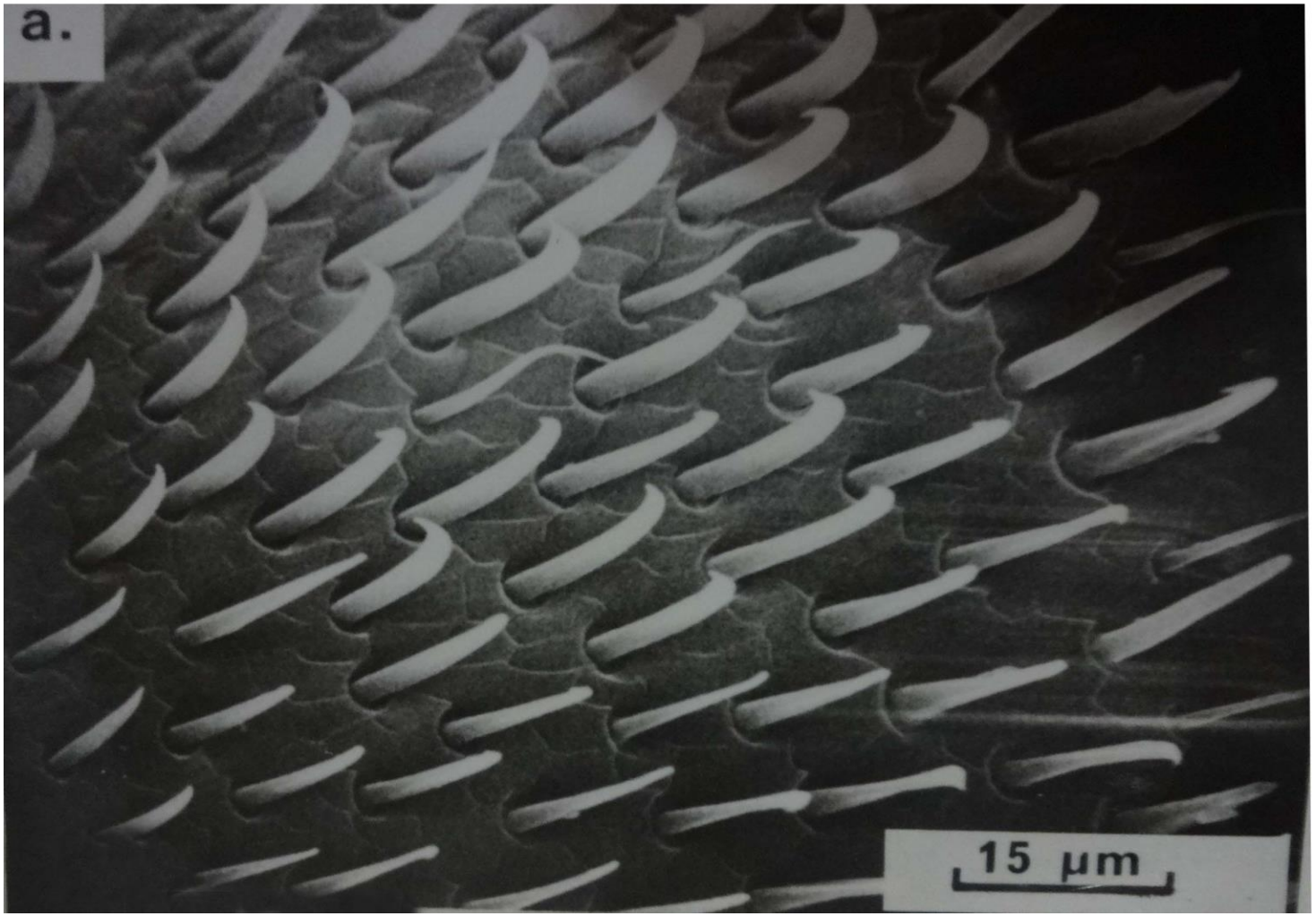


Mechanoreceptors of the scape distal

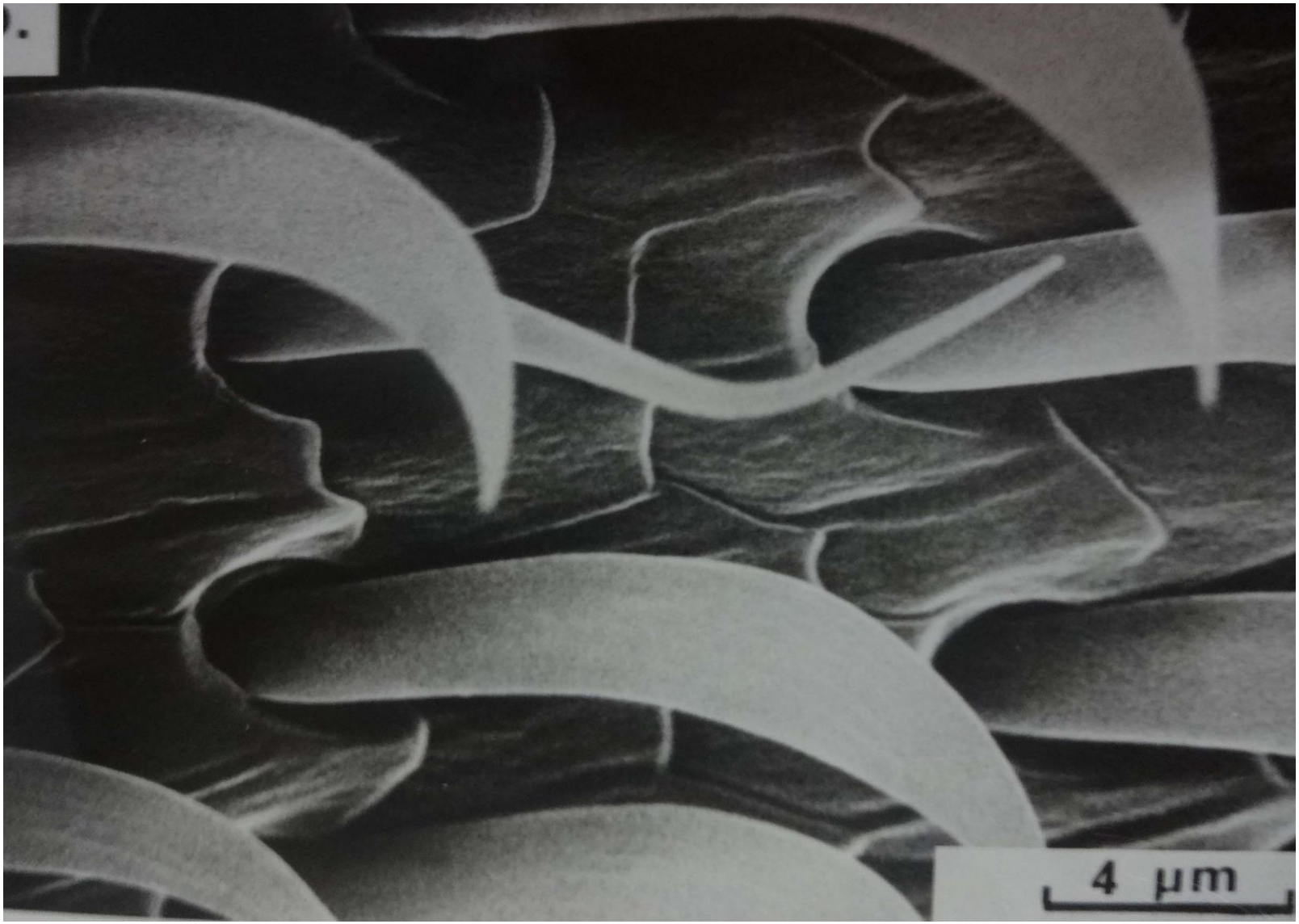



BIGSTOCK
www.bigstock.com · 17097533

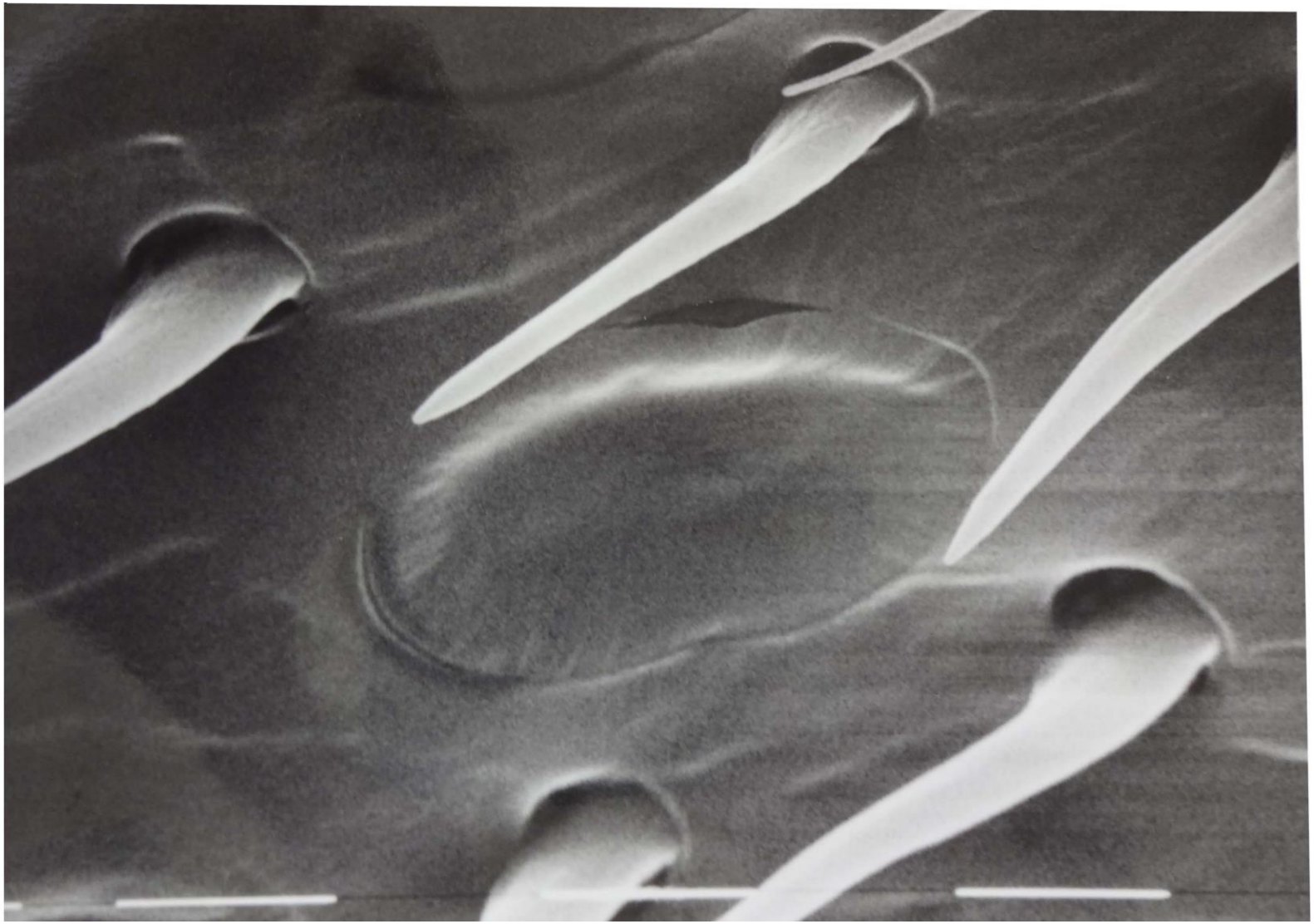
Trichodea of flagellar segment 2 at low magnification



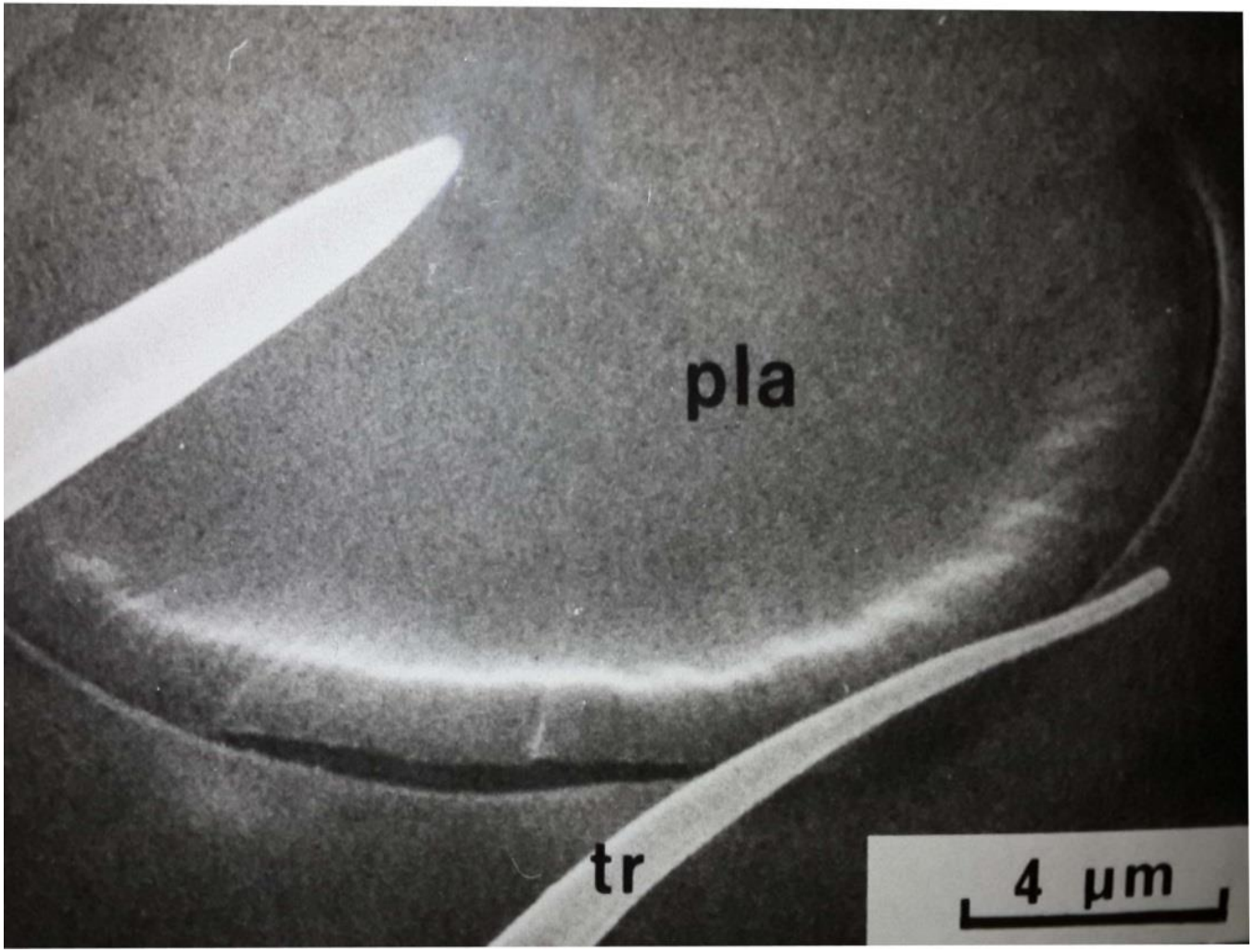
Trichodea of flagellar segment 2 at high magnification



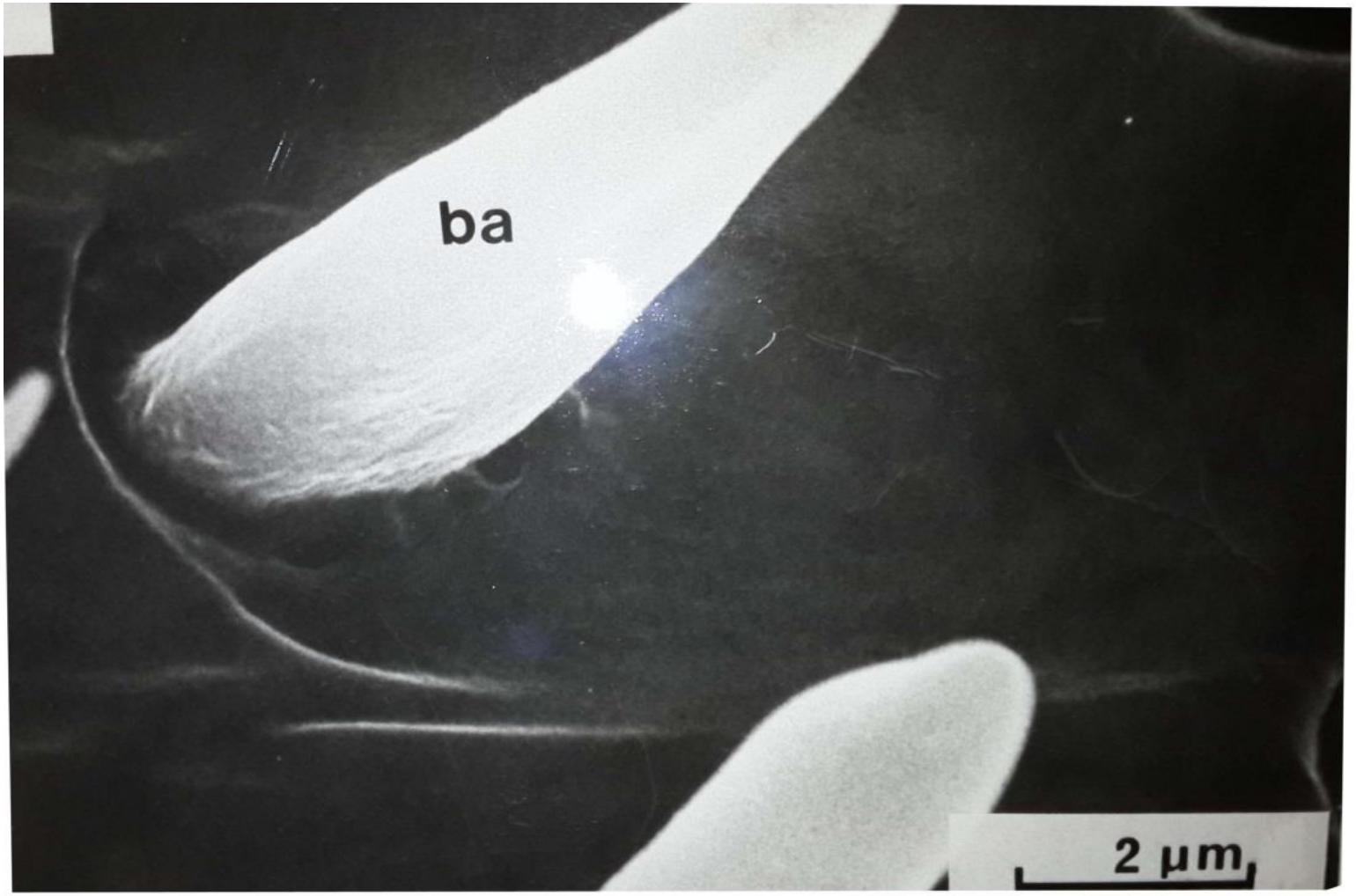
Three different sensilla on: segment 4, and segment 5. ba, basiconicum ; pla, placodeum; tr, trichodeum



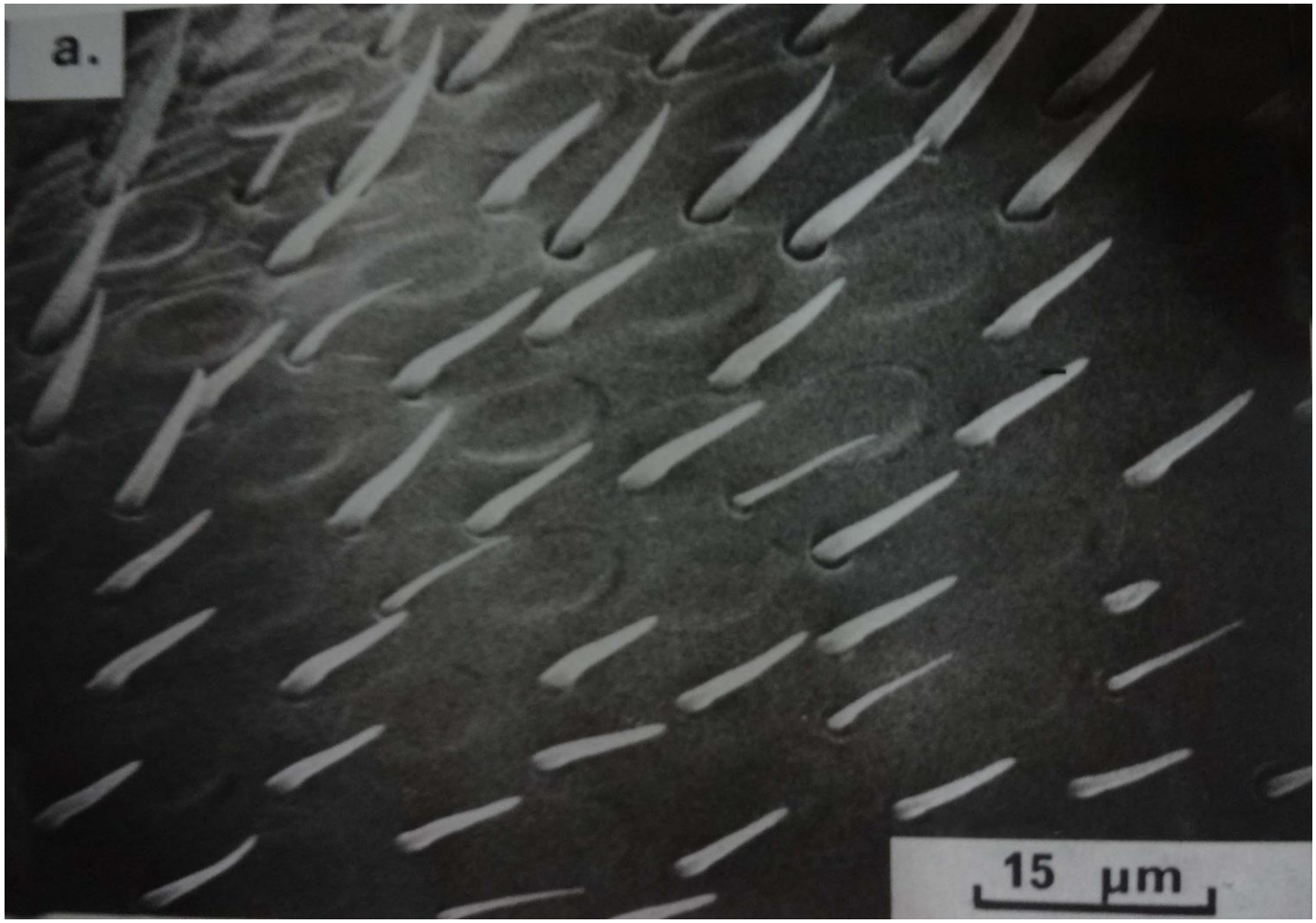
Three different sensilla on : a segment 4, and b segment 5. ba, basiconicum ; pla, placodeum ; tr, trichodeum



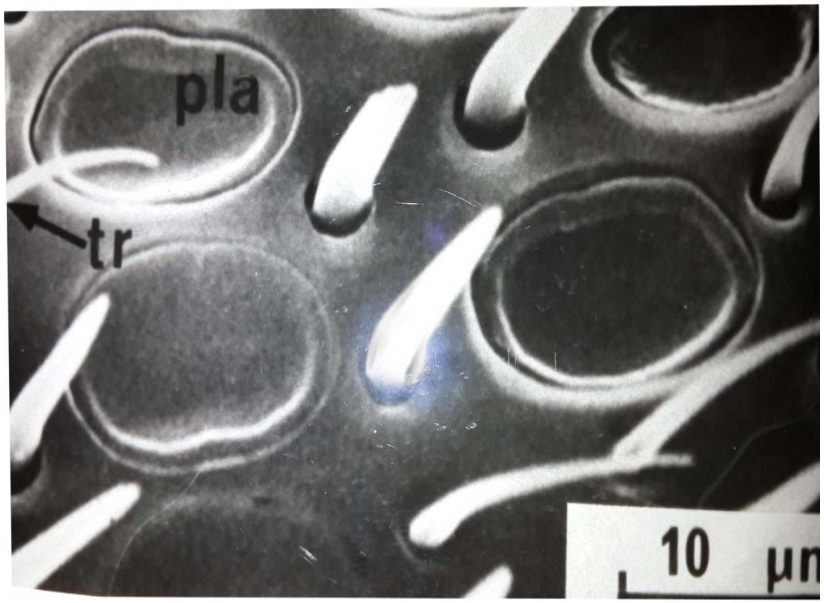
Three different sensilla on : a segment 4, and b segment 5. ba, basiconicum ; pla, placodeum ; tr, trichodeum

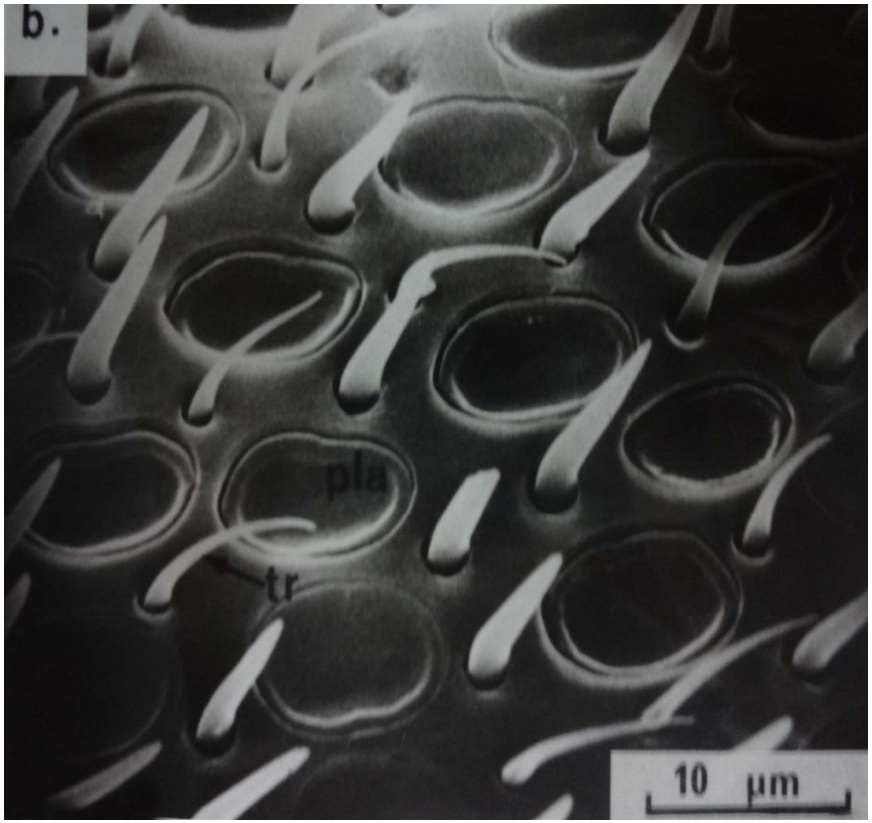


Mixtures of sensilla on: a segment 3 , b segment 9 pla, placodeum ; tr, tricodeum

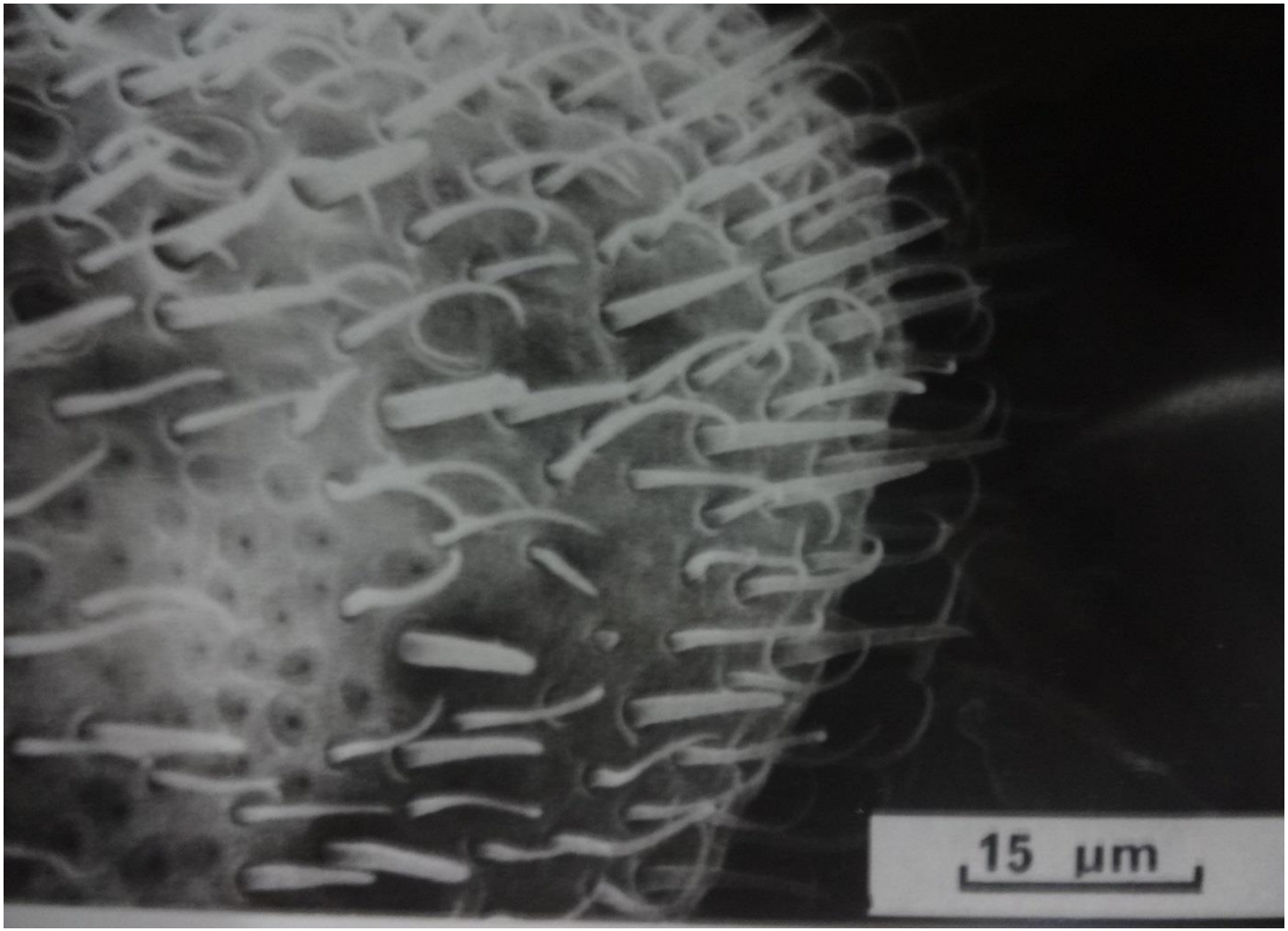


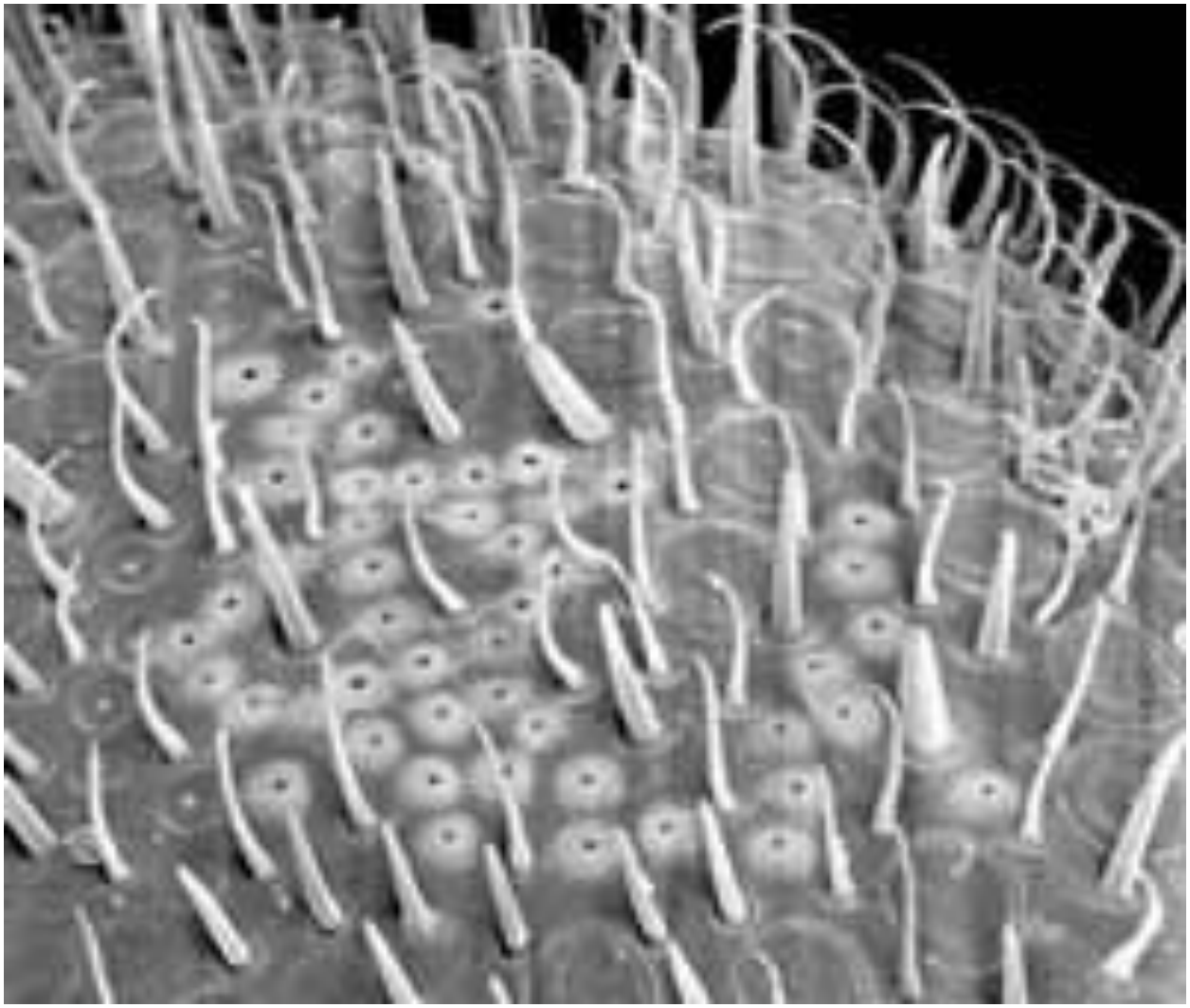
Mixtures of sensilla on : a segment 3 , b segment 9. pla, placodeum ; tr, tricodeum



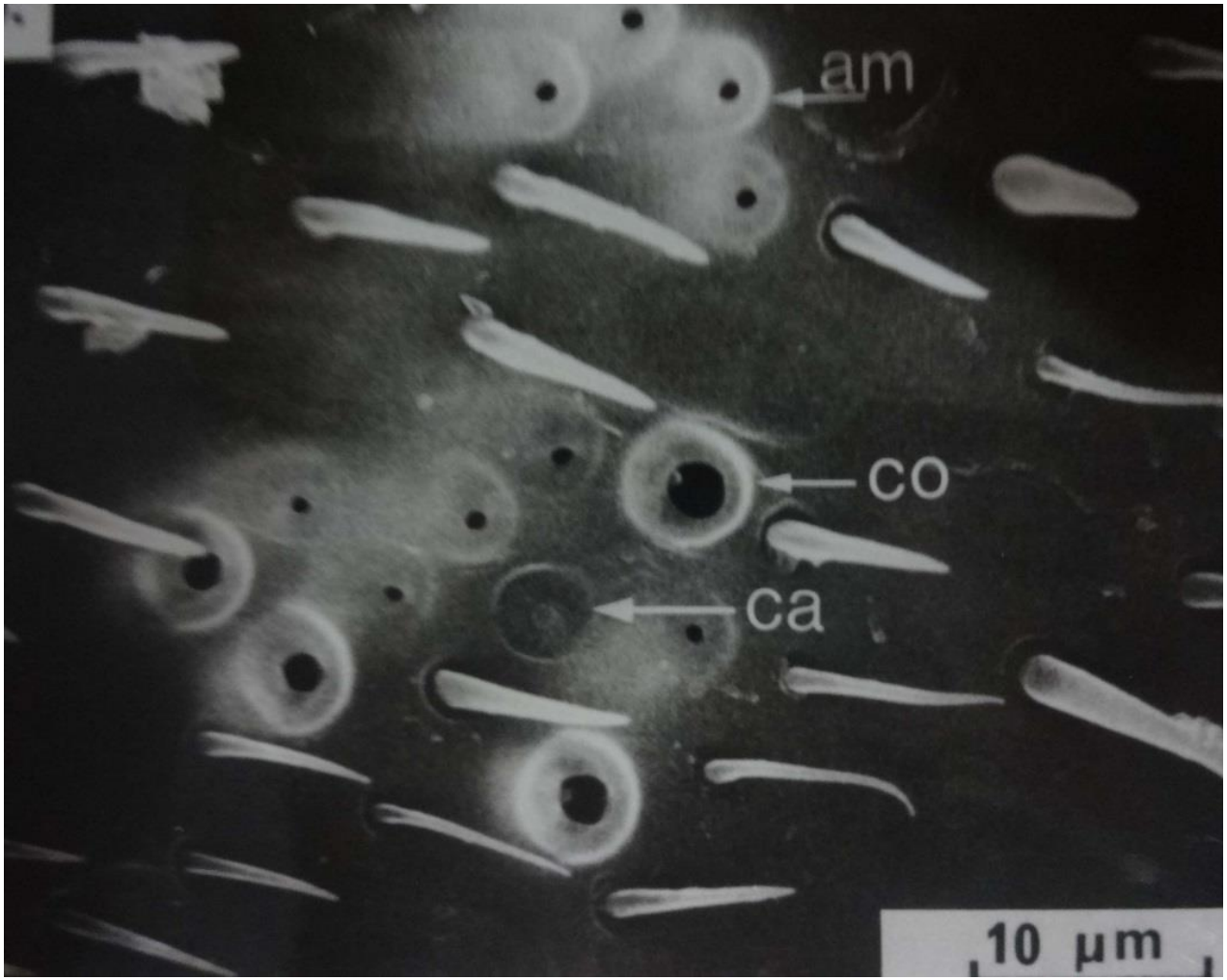


Pit sensilla on flagellar segments : a 10 and b 8 . Am , ampulaceum ; ca, campaniformium co, coeloconicum .

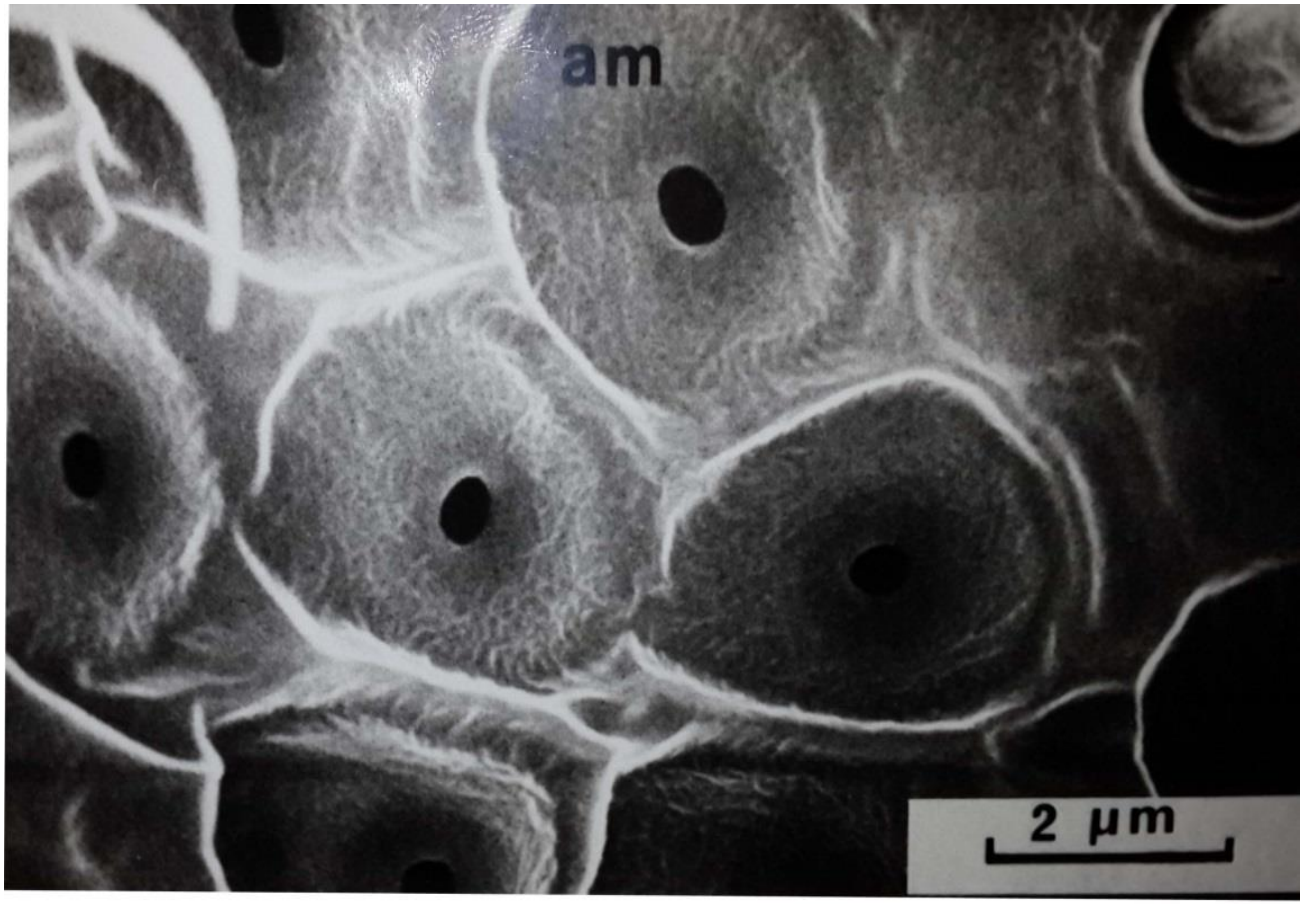




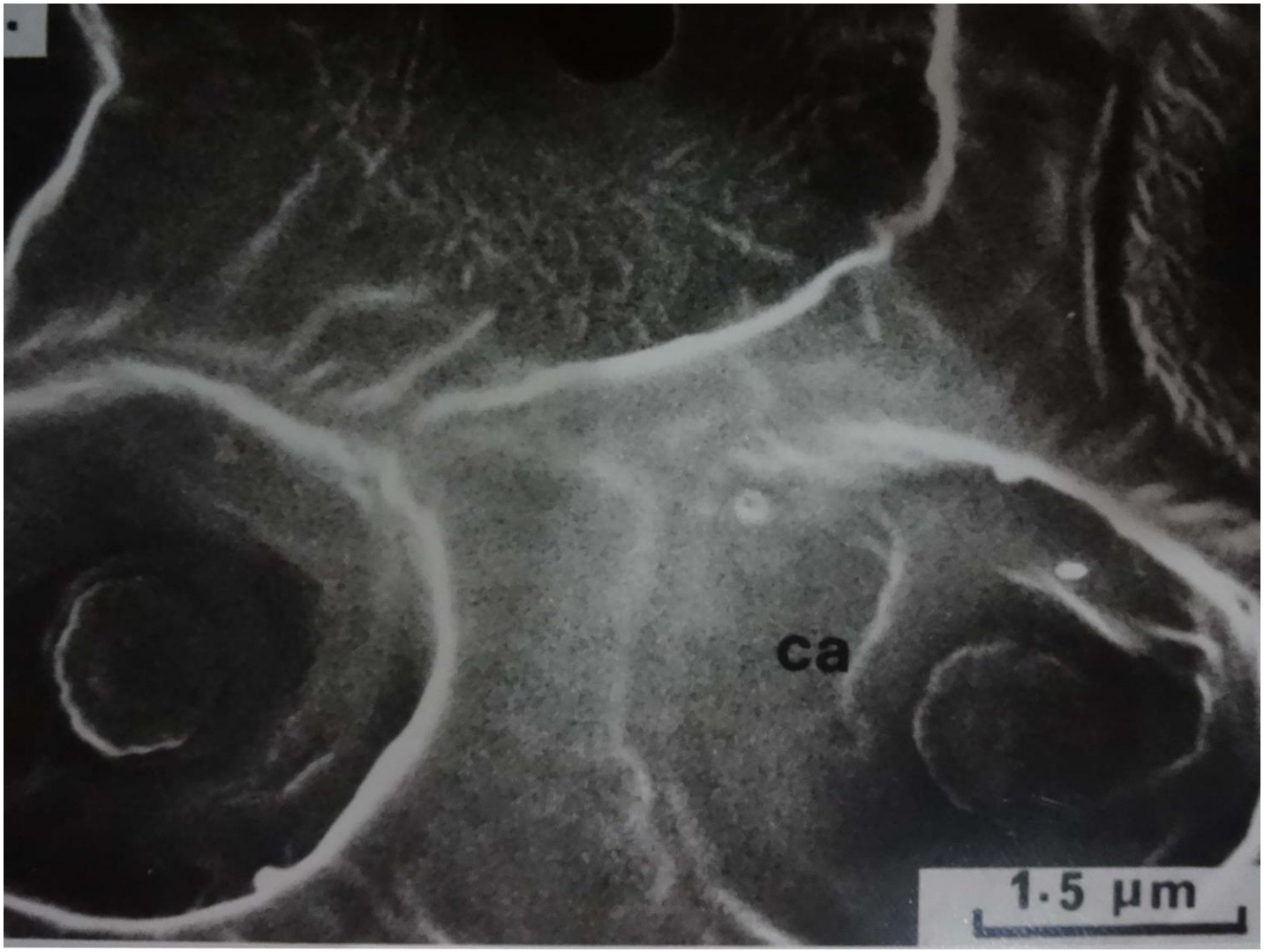
Pit sensilla on flagellar segments: a 10 and b 8 . Am, ampulaceum ; ca, campaniformium co, coeloconicum .



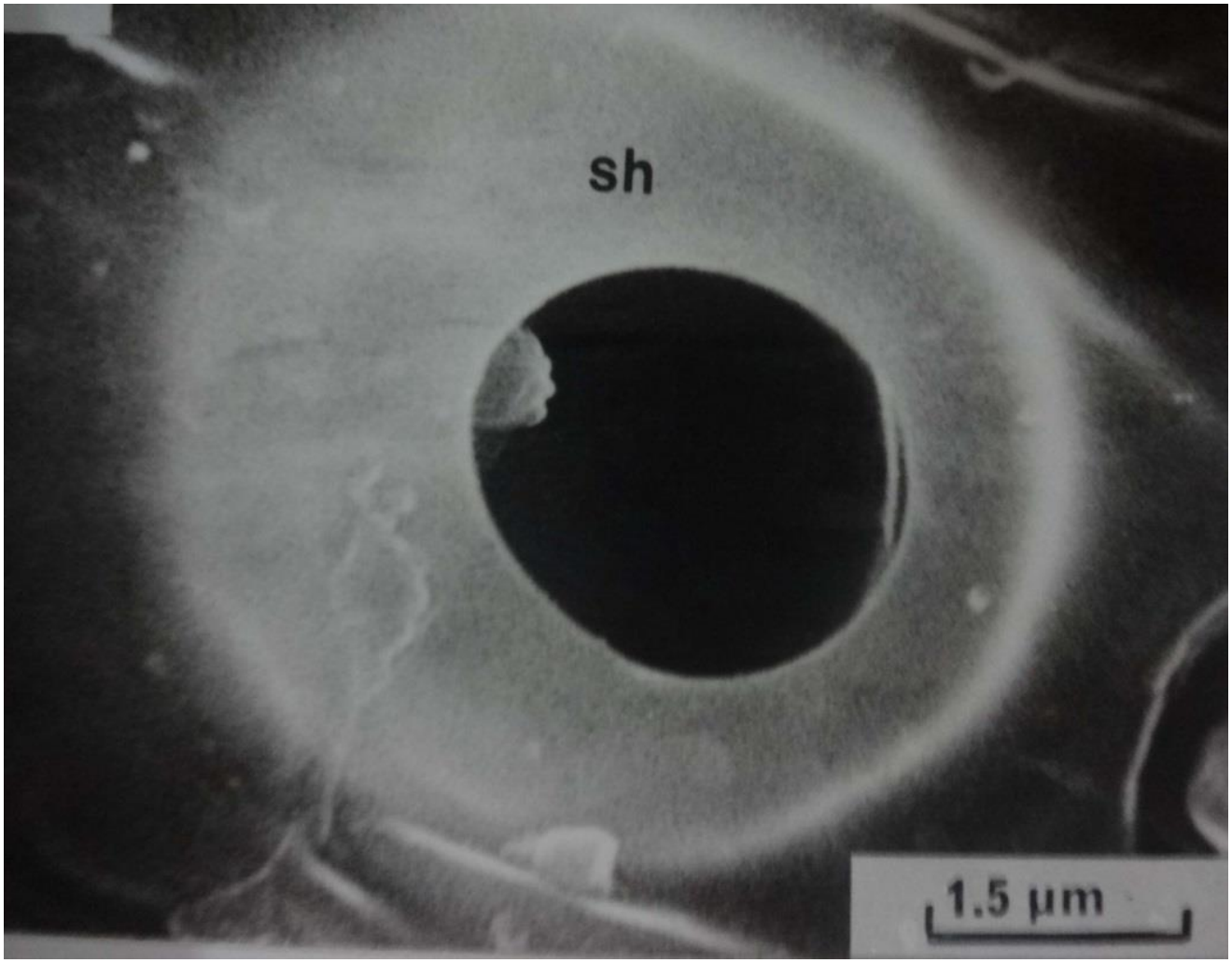
Pit sensilla on flagellar segments: a 10 and b 9 . am, ampullaceum ; ca, campaniformium .



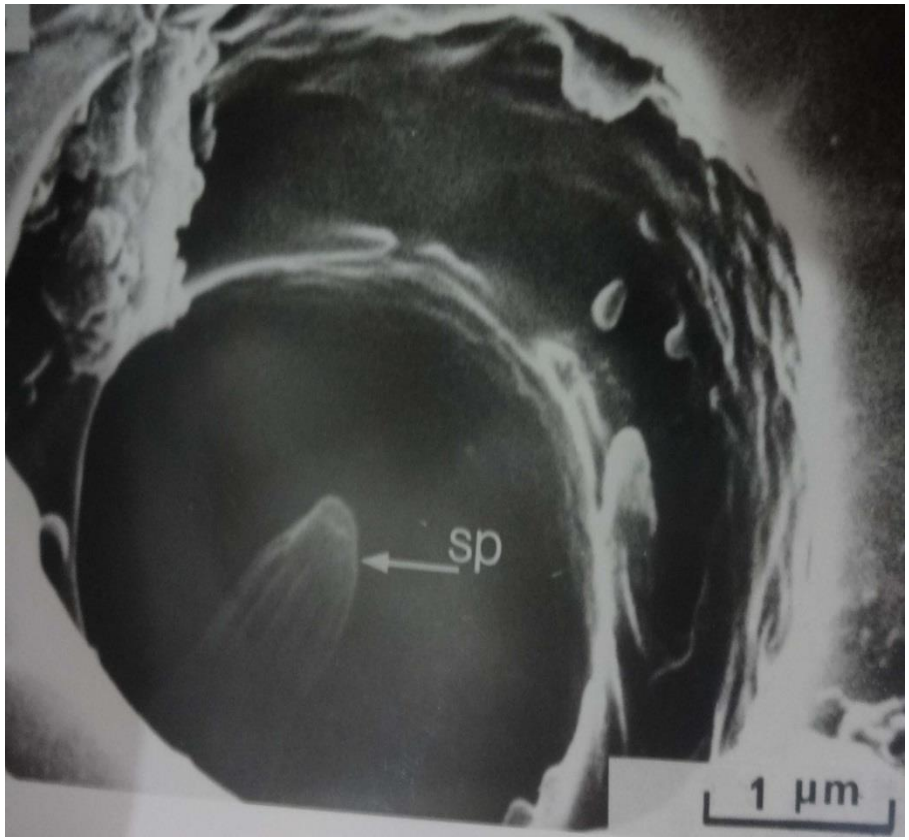
Pit sensilla on flagellar segments : a 10 and b 8 .
Am , ampulaceum ; ca, campaniformium .



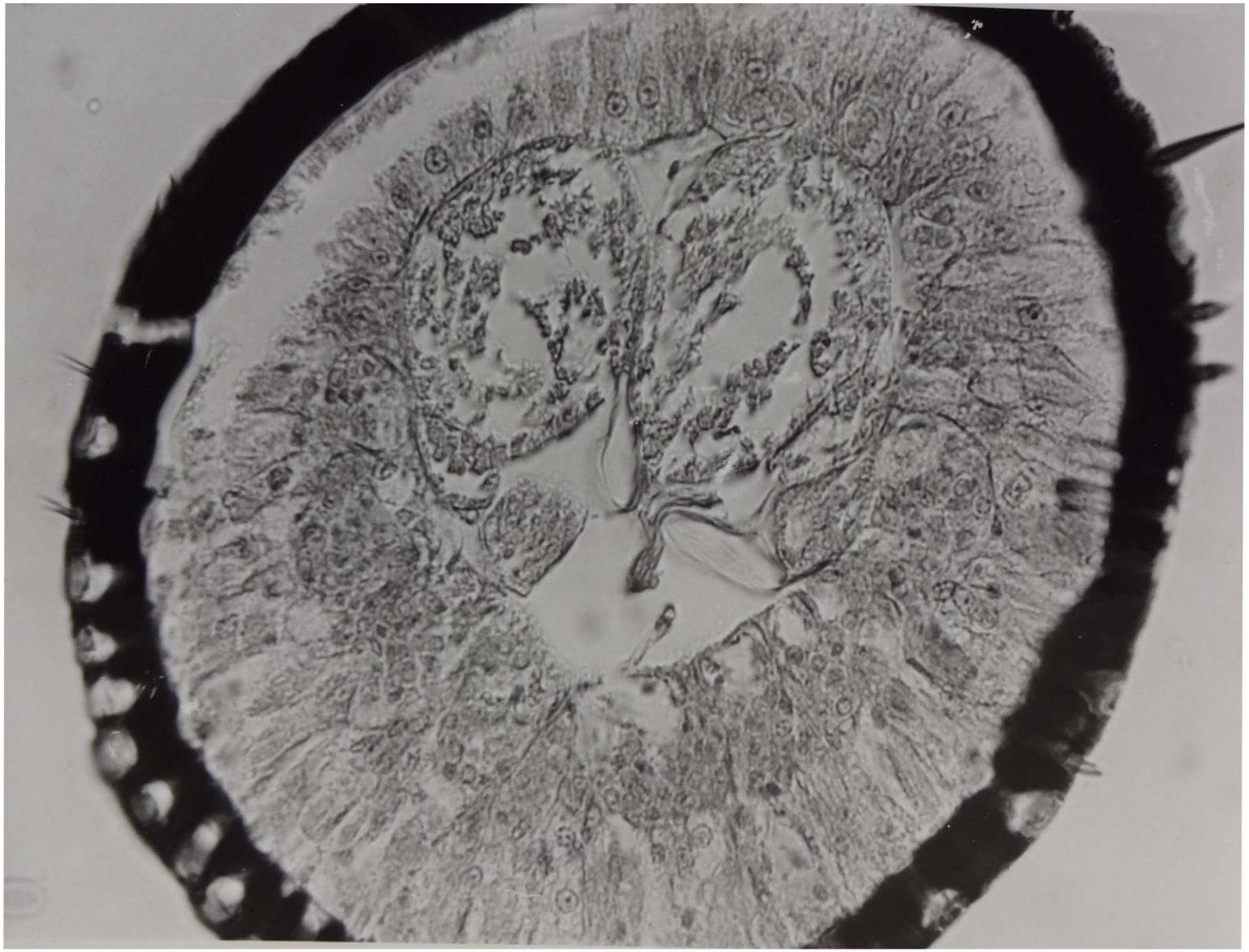
Coeloconica on flagellar segments a 8 with cuticular shroud intact, and b, 9 with shroud removed to expose the sensory probe. sh, shroud; sp, sensory probe



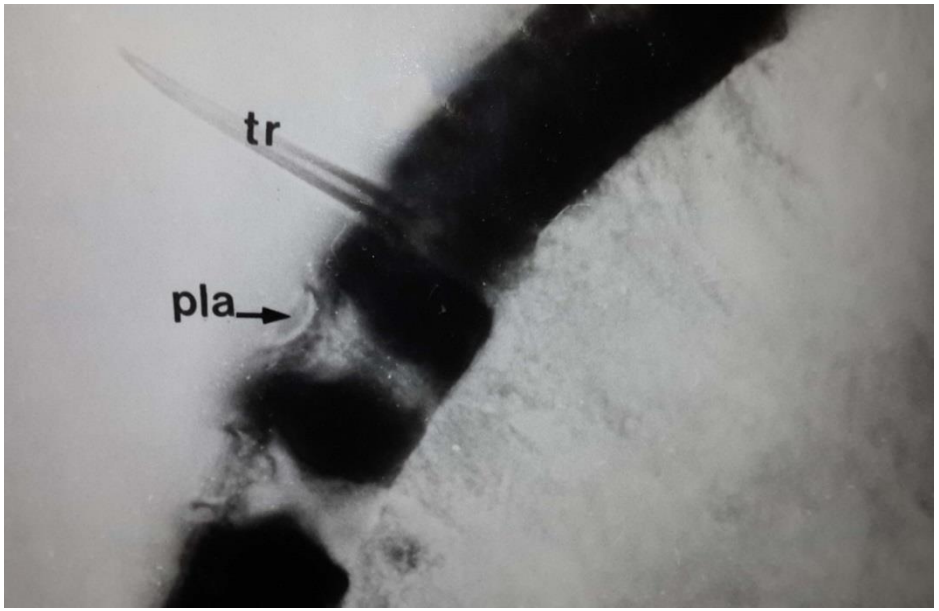
Coeloconica on flagellar segments a 8 with cuticular shroud intact , and b , 9 with shroud removed to expose the sensory probe . sh, shroud; sp, sensory probe.



Cross section through a worker antenna

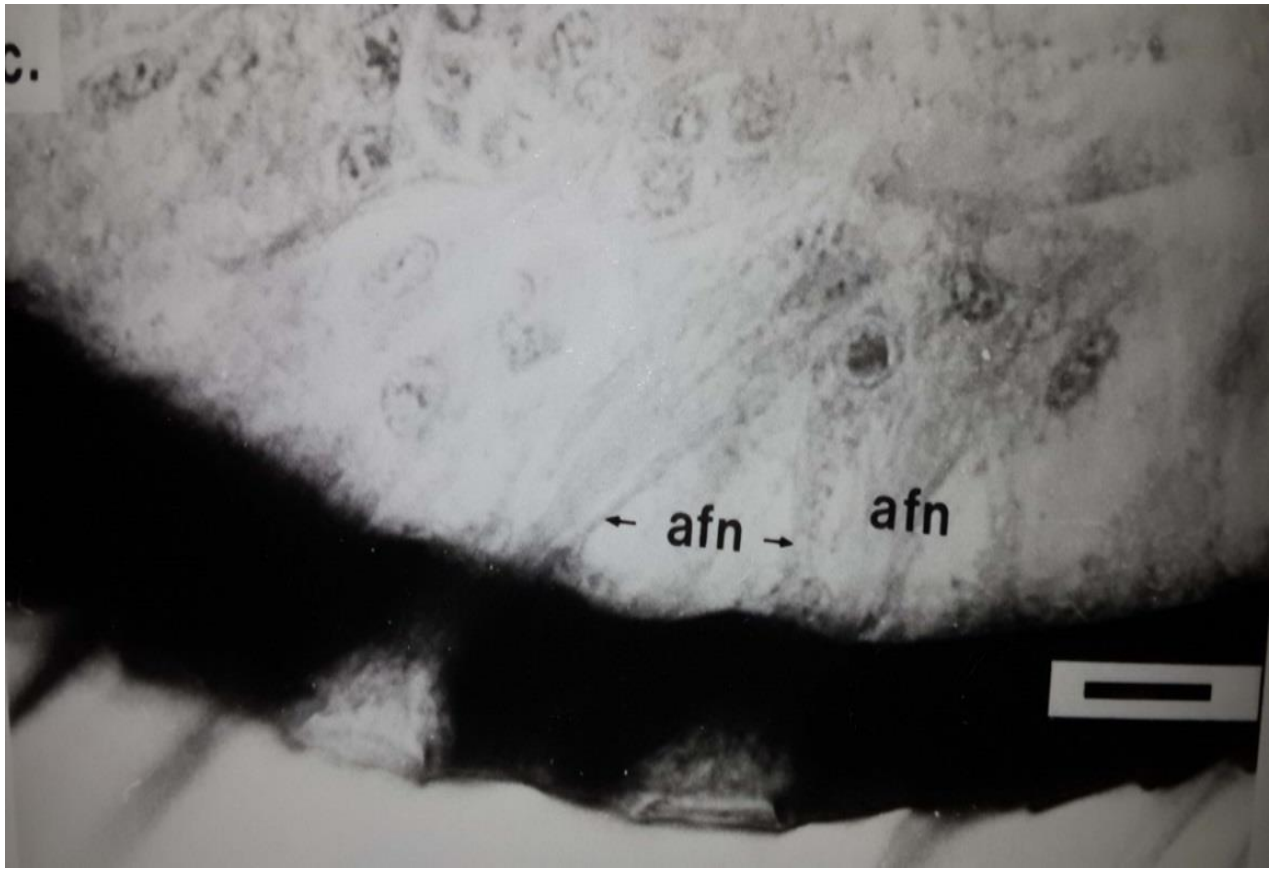


H&E-stained transverse sections through a worker antenna .(a.b) Different focal planes off the same section ; (c) a second section . D, diffusion surfaces for chemoreception ; afn , afferent neurons of the antennal nerve ; pla, sensillum placodeum ; tr, sensillum trichodeum . bar, 10um.



H&E-stained transverse sections through a worker antenna. (a.b) Different focal planes off the same section; (c) a second section. D, diffusion surfaces for chemoreception; afn, afferent neurons of the antennal nerve; pla, sensillum placodeum; tr, sensillum trichodeum. bar, 10um.

H&E-stained transverse sections through a worker antenna. (a. b.) Different focal planes off the same section ; (c) a second section . D, diffusion surfaces for chemoreception ; afn , afferent neurons of the antennal nerve ; pla, sensillum placodeum ; tr, sensillum trichodeum . bar, 10um.



Thank you