




The head

Center of
information (can you name at least 3 types?)
gathering & processing



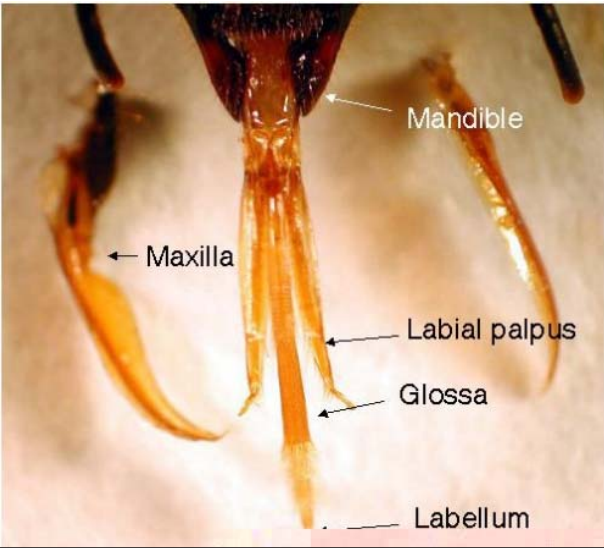
Optical input
How many eyes does a bee have?



Ocelli **function?**

Detailed description: This image shows a close-up of the dorsal view of a bee's head. The large compound eyes are on the sides. Between them, there are three pairs of small, dark, circular ocelli. Red arrows point from the text 'Ocelli' to these structures. The text 'function?' is placed to the right of the arrows.

Food input
Most insects have:
 either chewing: grasshoppers,
Or sucking mouthparts:
But bees have both!



← Maxilla

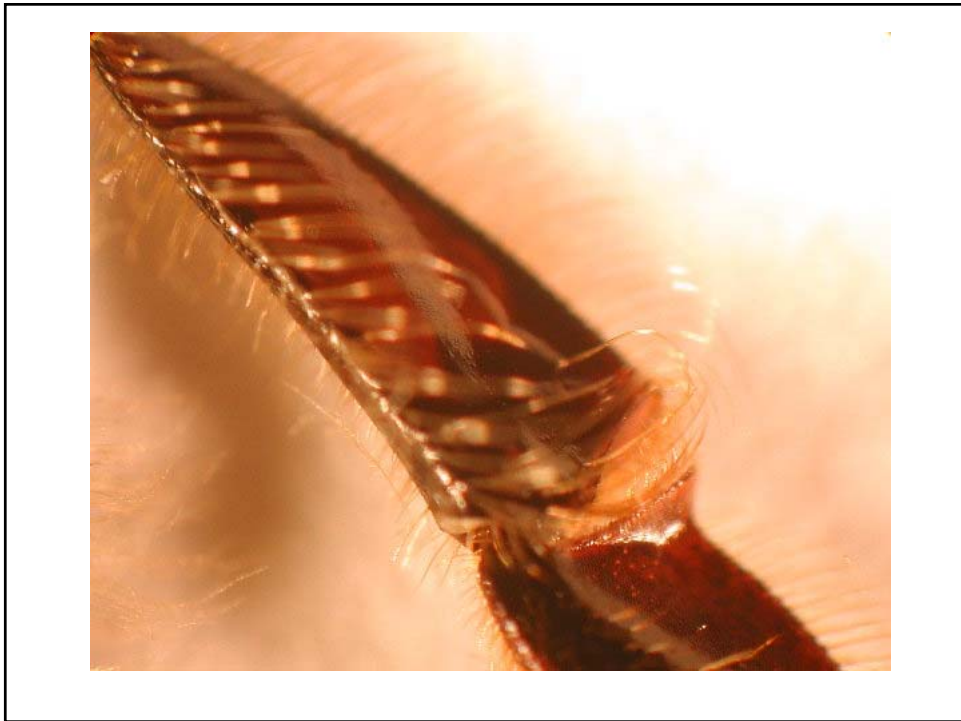
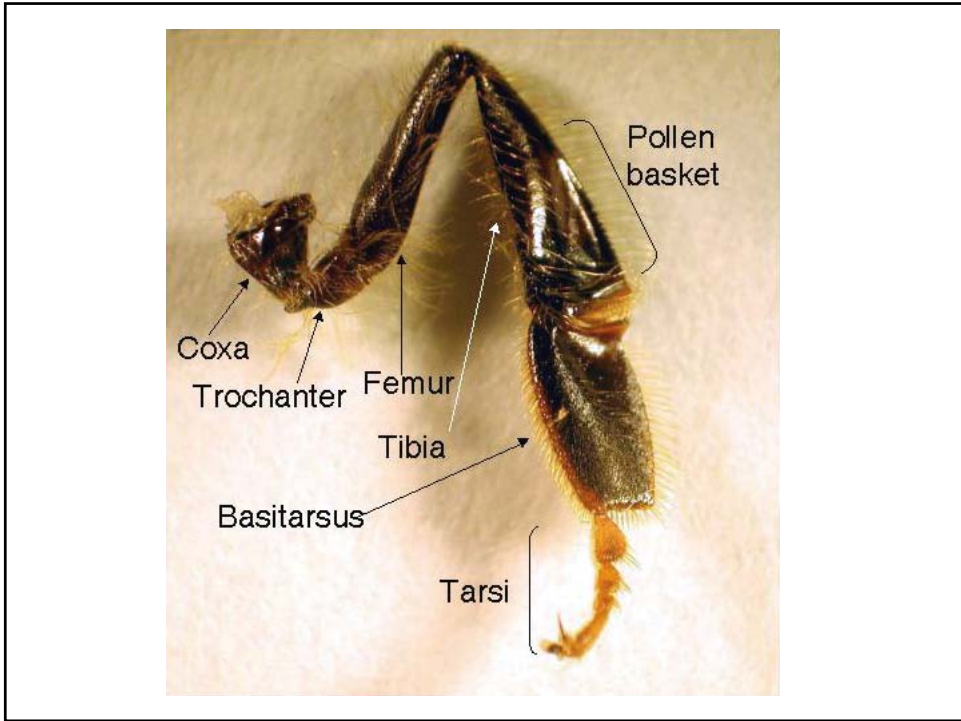
Mandible

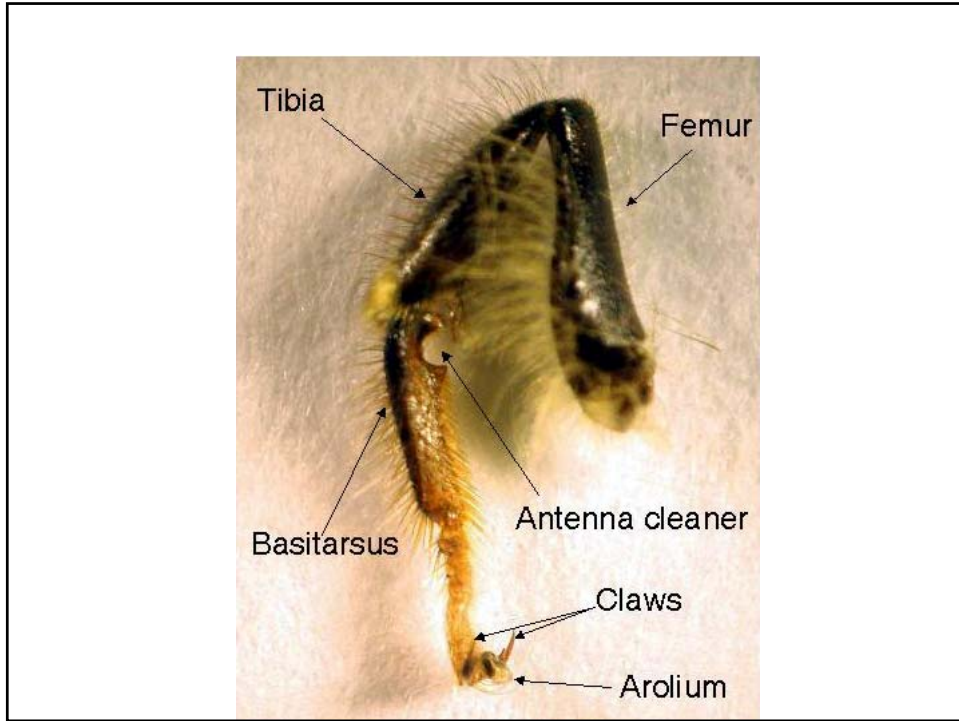
Labial palpus

Glossa

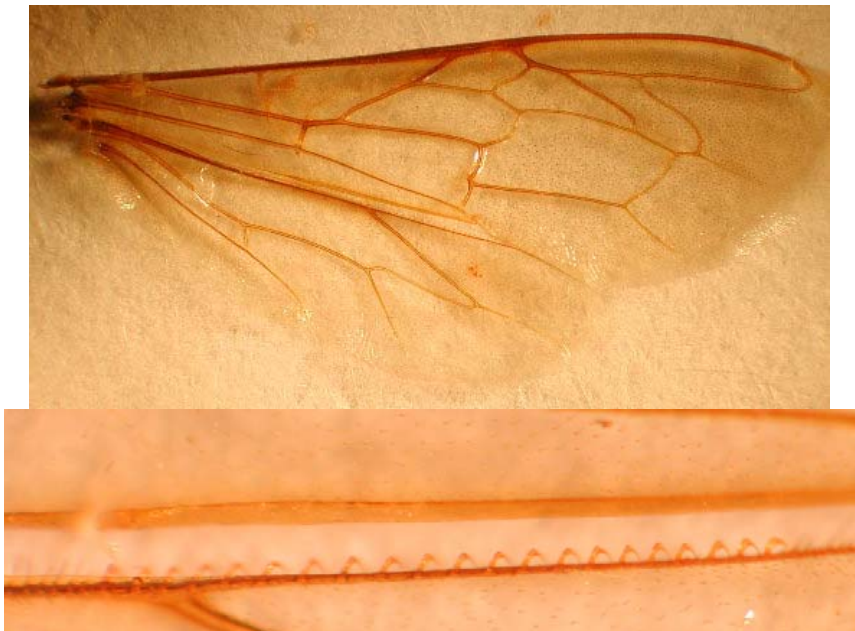
Labellum

Detailed description: This image shows the ventral view of a bee's mouthparts. The mandibles are at the top. Below them are the maxillae. The labial palpus is a long, thin structure. The glossa is a long, thin, needle-like structure. The labellum is at the bottom. Labels with arrows point to each of these parts.

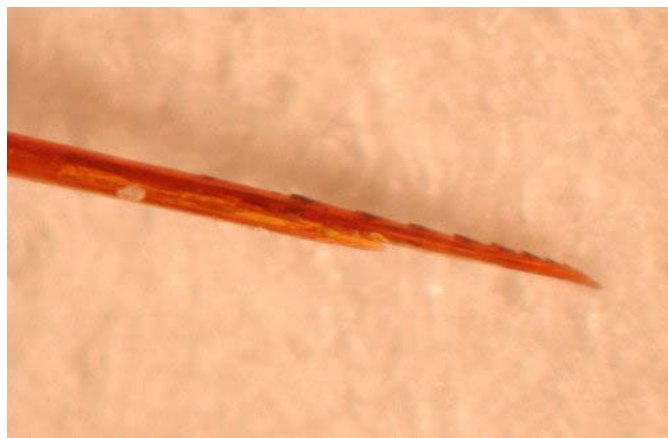




Hamuli (wing hooks)



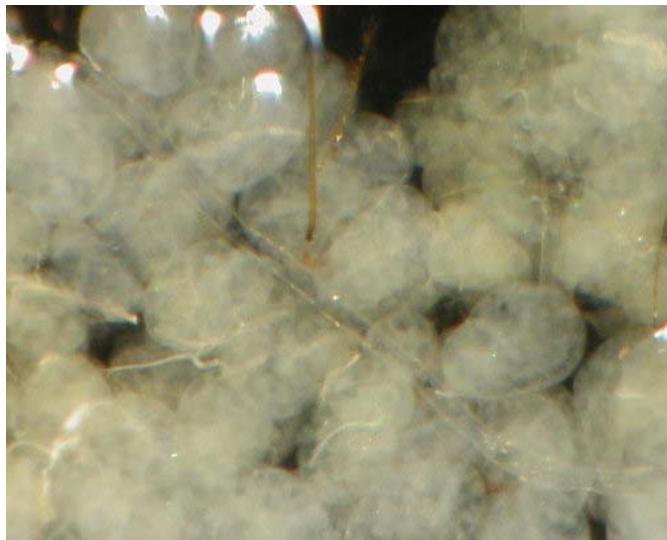
Stinger with venom



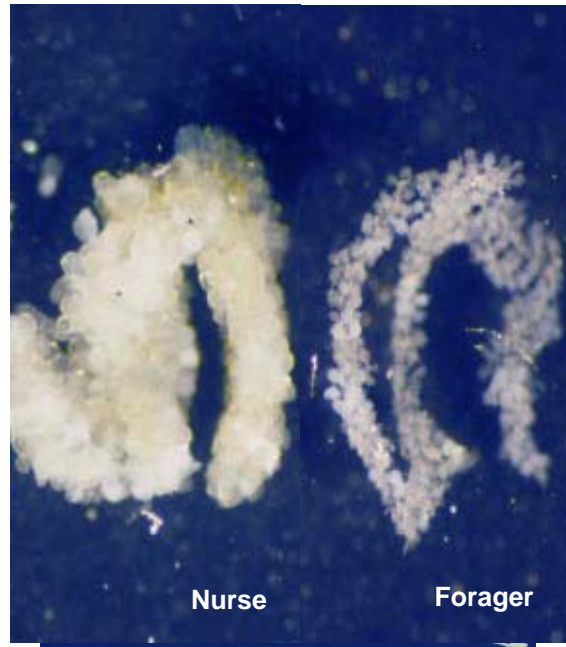
Inside the head:
hypopharyngeal glands:
produces protein for royal jelly in nurses,
but invertase in foragers



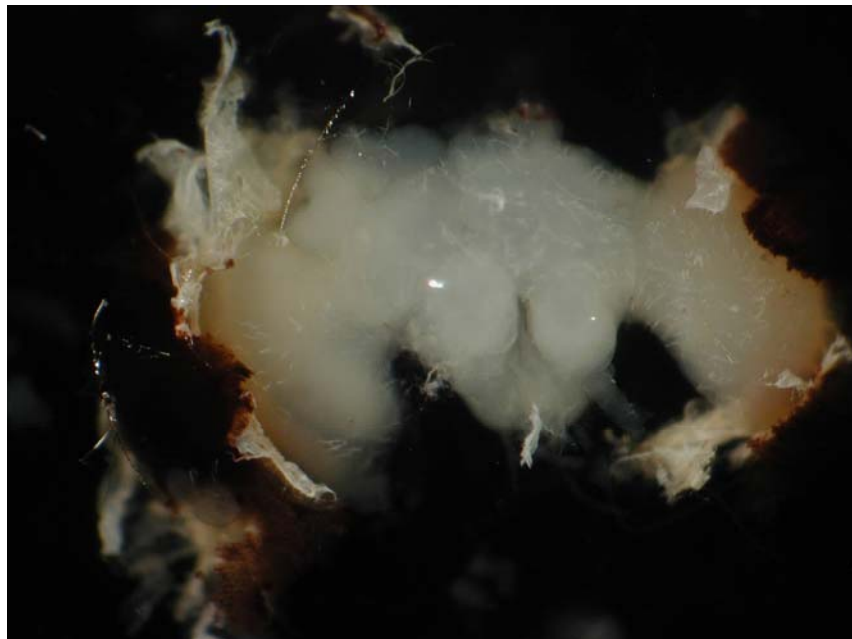
Individual “acini” of glands



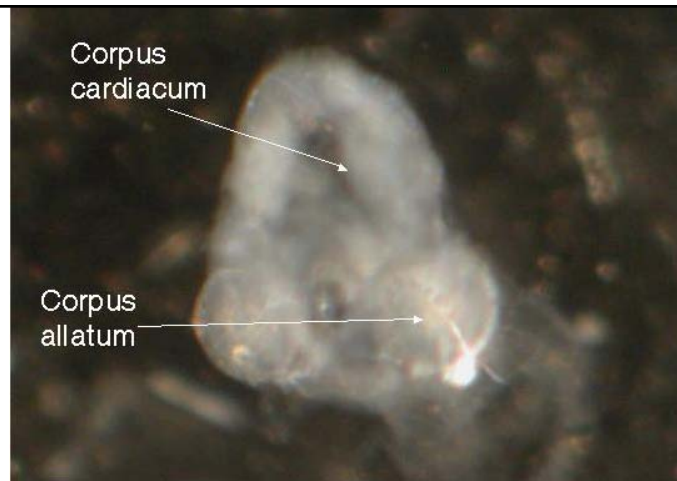
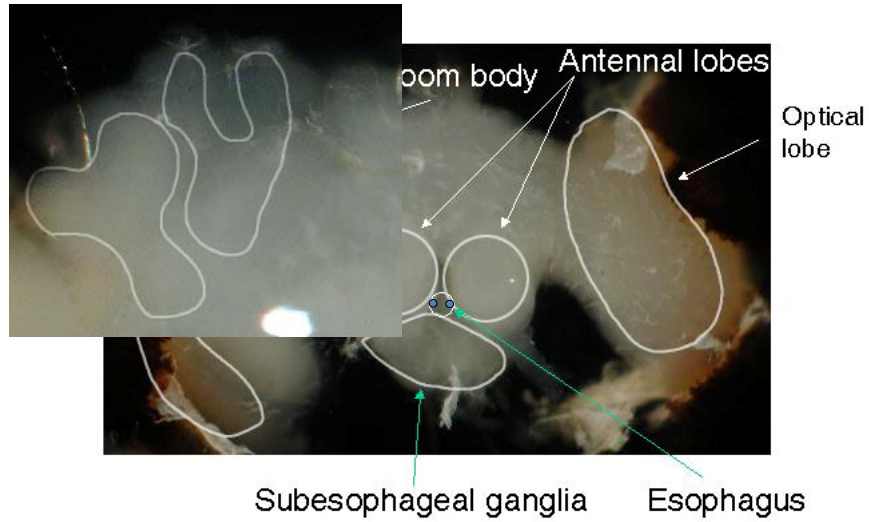
Regression of hypopharyngeal gland



After removal of glands and trachea:



An annotated bee brain



Corpora allata: the only organ that produces juvenile hormone (caste differentiation, molting, division of labor)

Mandibular glands

Also changes function with age:

Young bees: lipids for royal jelly

Old bees: alarm pheromone (2-haptanone)

What is the other one? Isopentyl acetate



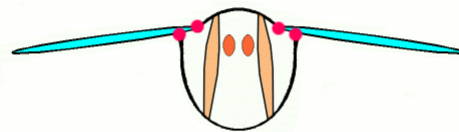
Thorax: flying, walking, pollen collection !(branched hairs)



Flight muscles



How do bees fly? Compressible box with fulcrum



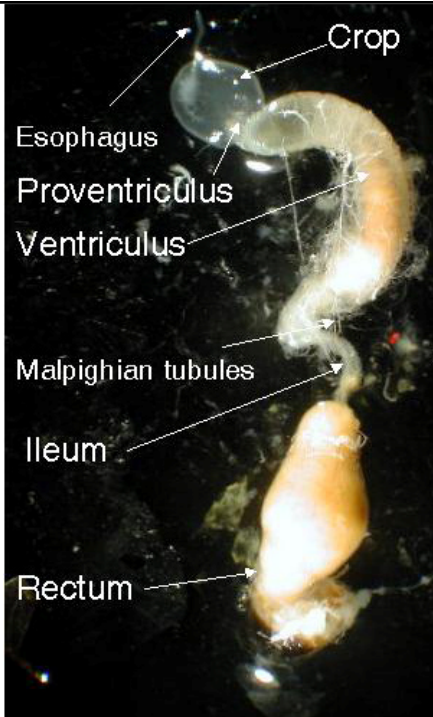
How do bees get warmth during winter
(remember, you do not want to move your wings!)

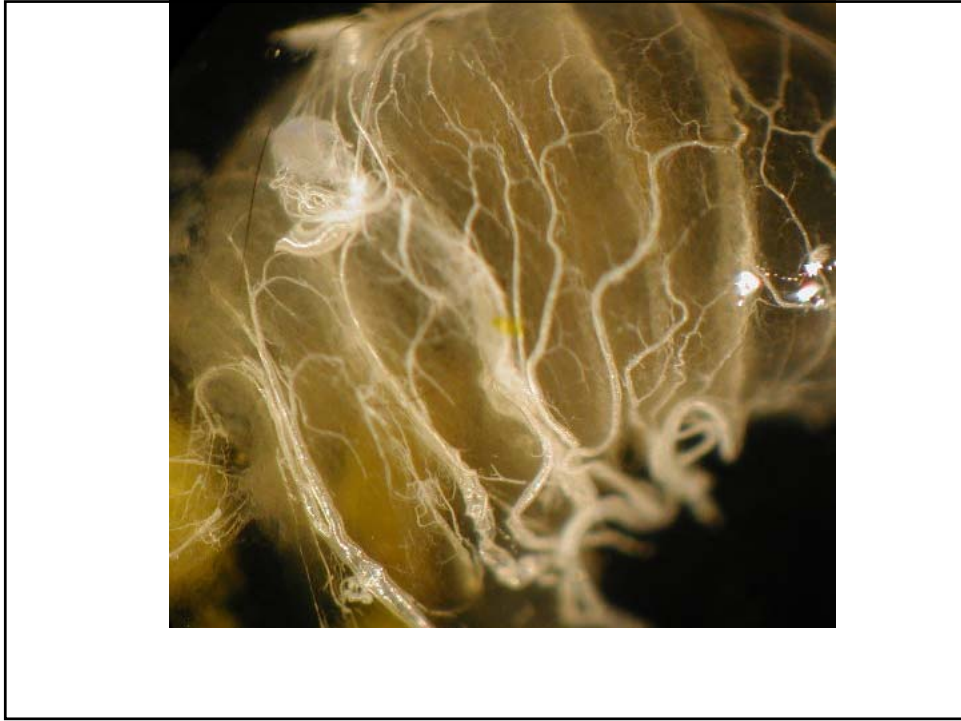
http://wpcontent.answers.com/wikipedia/commons/c/c2/Motion_of_Insectwing.gif

Abdomen
(digestion, defense and wax production)
Wax glands



Are honey “bee vomits”?





Ovarioles of Queen



Summary

- Antenna can hear, smell and taste
- Bees do have brains! (1 million neuron)
- Two glands change functions with age
- Thorax is almost all muscles
- Pollen basket is really a dent with hairs around
- Hind wings hitch-hike on the front ones
- Honey is not “bee vomit”!

Huang's websites

- <http://cyberbee.net/gallery>
- <http://www.beetography.com>
- Anatomy of honey bee by Huang:
 - <http://www.extension.org/pages/21754/anatomy-of-the-honey-bee#.UxizgoUlsuU>
- Email: bees@msu.edu