



Colony or Supercritter?

Social Insects in Review



Apis mellifera



- Kingdom Animalia
(multicell ingestive heterotroph)
- Phylum Arthropoda
(chitinous jointed exoskeleton)
- Subphylum Hexapoda
(uniramous paired appendages)
- Class Insecta
(3 tagmata, 6 legs)
- Order Hymenoptera
(4 membranous wings, slender waist)

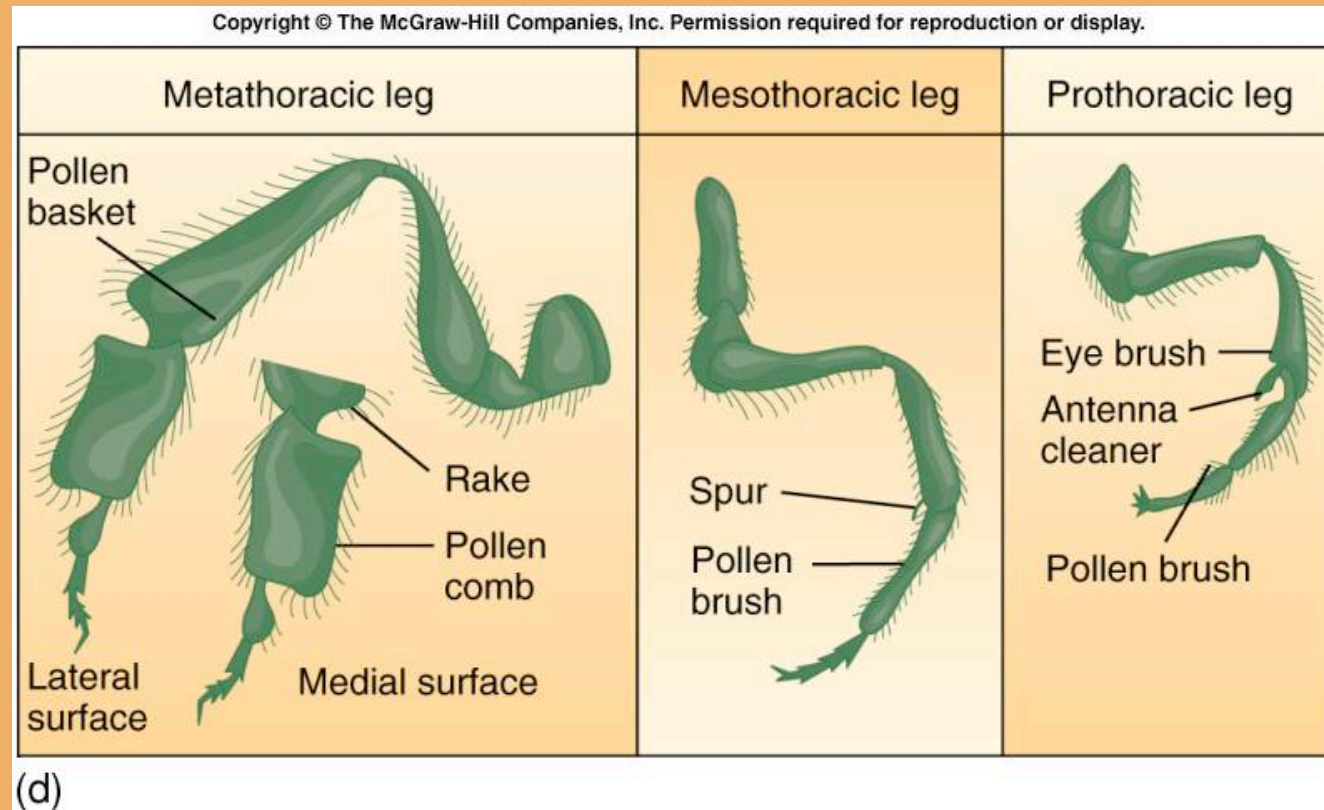


Apis mellifera



Plasticity of Chitin

- Molded to multiple ends & uses



Well-armed Females



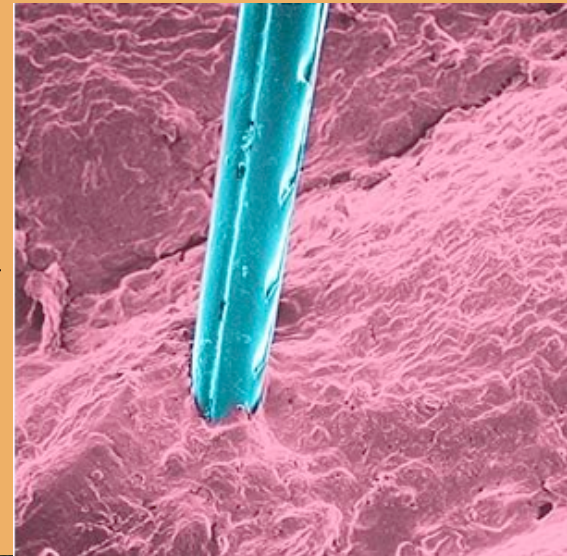
- Drones (males) have no stingers.
- Queen (fertile female) has a barbless stinger.
- Workers (sterile females) have barbed stingers.





Barbs = Suicide Attacks

- Anchored in animal skin the barb yanks out the posterior abdomen & poison gland.



Scrape.
Don't pinch
and pluck.



An Altruist or an Appendage?



- An individual worker bee sacrifices her life to the hive.
- Her genes benefit by entering the next generation...
- ...through her sister the queen.
- This is “kin selection.”



Caste of Characters



- Haploid stingless male = Drone
- Diploid fertile female = Queen
- Diploid sterile female = Worker

Life Cycle of the Hive



- A new colony is founded.
- A colony grows in numbers of bees.
- A colony divides.
- Old queen seeks a new site.
- New queen renews colony at old site.



Life of a Drone (N)



- First an egg, then a haploid larva fed by older sisters.
- Pupates (after sisters seal him) in a comb cell.
- Emerges and is fed/tolerated by workers.
- Chases after queen to join “mile-high” club.
- Tolerated or driven out come winter.



Life of a Worker Bee (2N)



- Begins as an egg, then a larva fed by older sisters.
- Receives hormonal “royal jelly” for a limited time.
- Pupates (after sisters seal her) in a comb cell.
- Emerges and cleans up her room (cell).
- Begins a series of age-determined jobs.





Worker Bee Job Description

- Feeds young larvae, cleans & cools house.
- Generates wax, builds comb and caps.
- Moves & thickens nectar to honey.
- Guards hive and attacks invaders.
- Forages for nectar and pollen.





Life of a Queen

- Begins as an egg, then a larva fed by older sisters.
- Receives hormone-rich royal jelly continuously.
- Pupates after sisters seal her in an enlarged comb cell.
- Emerges & eliminates any possible rival queens.
- Takes half the hive on a nuptial flight.



Life of a Queen cont'd.



- Mates high aloft and returns to the hive.
- Lays fertilized eggs until nuptial flight sperm is exhausted.
- Begins laying more haploid eggs (thus more drones).
- Leaves hive as new queens develop.
- Has a second nuptial flight.
- Swarms to found a new hive.



‘Pictionary’ Beehive

- Inspiration for “big-hair” do’s
- Inefficient clumsy harvests
- High wax, low honey yields



Lorenzo Langstroth



- Philly Rev. Lorenzo Langstroth discovers “bee space”
- Builds the first modern hive in 1851
- Uses moveable frames to contain the comb.
- The modern frame hive is often called the Langstroth hive



‘Bee Space’:



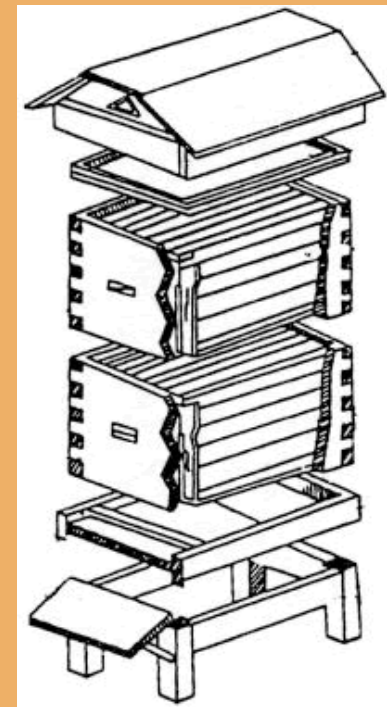
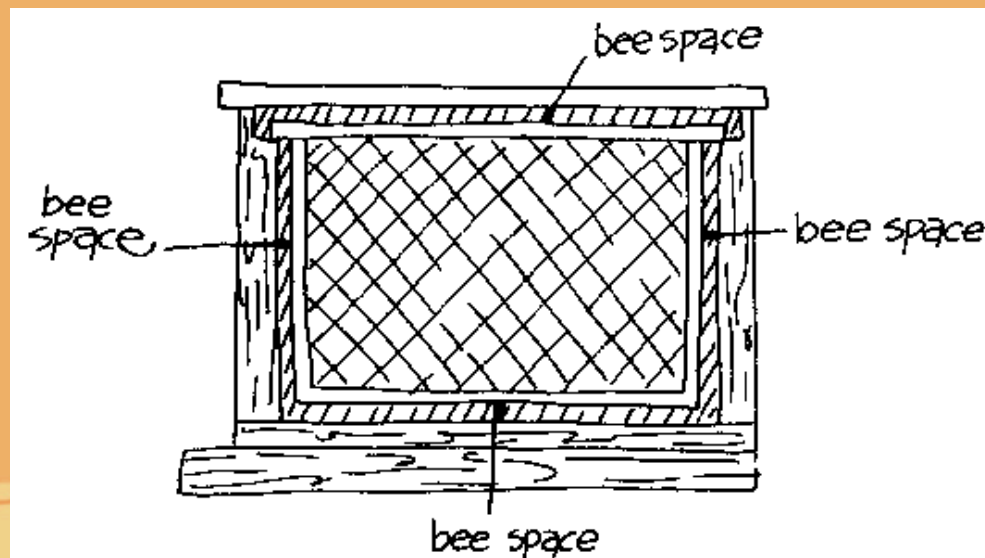
Key to Modern Apiculture

- Bees maintain open spaces $3/16$ inch and $3/8$ inch. (‘bee space’)
- Narrower than $3/16$ inch (4mm), the bees seal it with propolis.
- Larger than $3/8$ inch (9mm), the bees build comb across it.
- Bad space:



Hive Architecture

- Foundation in frames
- Frames in Supers
- Supers between cover and bottom board



Stingless Stealing

- Smoke 'em before you rob 'em.
- Upon smelling smoke bees fill their bellies with honey.
- A honey-gluttled bee doesn't (can't?) sting.
- Is such behavior adaptive? How?

