



SOBA Bee School  
April, 2015



# Bee Girl

- University of Montana, Missoula
  - Iridovirus and Microsporidian Linked to CCD
  - Sonographic analysis of hive health
  - Pesticide effects
  - “Bomb sniffing” bees
  - OLLI

**The Bee Girl mission  
is to inspire and  
empower  
communities to  
conserve bees and  
their habitat.**





**Beekeeping Education // Honey Bee Conservation**

# PRESENT ACTIVITIES

Kids and Bees

Beekeeping Workshops

Farming for Bees Initiative

Public Education

Next Generation Beekeepers Initiative

Bees and Honey!





# APPLYING BASIC BEE BIOLOGY AKA - BEEKEEPING

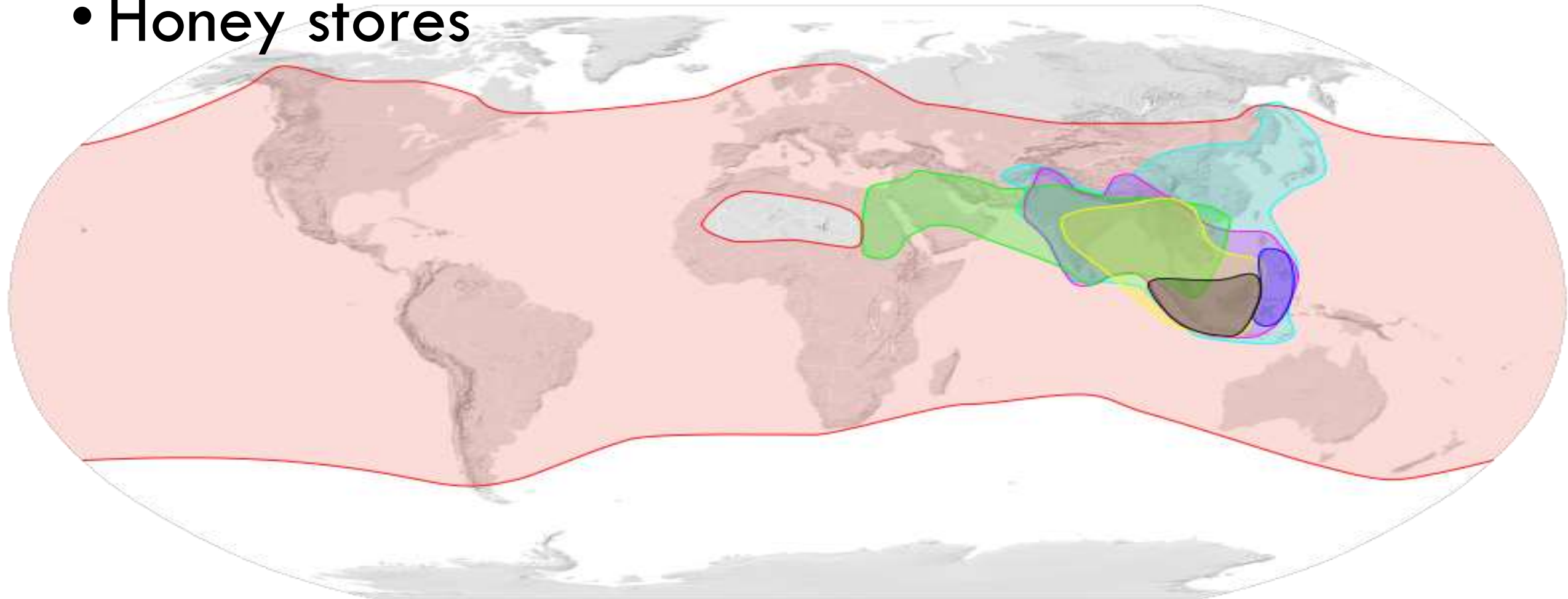


*APIS MELLIFERA* = WESTERN HONEY BEE



# HOW DOES *APIS MELLIFERA* HAVE SUCH AN EXPANSIVE RANGE?

- Thermoregulation
- Honey stores









ARE BEES ANIMALS?

# WHAT DO ANIMALS NEED?

Colony can weigh about 10 lbs – picture a small dog

Water

Shelter

Food

Medicine



# EUSOCIAL INSECTS

Individual Organisms and a Super Organism





**INDIVIDUAL BEE = ORGANISM**



**COLONY = SUPER ORGANISM**

GOAL OF THE ORGANISM (INDIVIDUAL BEE)=  
SURVIVE, AID IN *COLONY* REPRODUCTION





# GOALS OF THE SUPER ORGANISM (COLONY)

Survive

(get enough  
food to make it  
through the  
winter)

Reproduce

# INDIVIDUAL BEE BIOLOGY



The best beekeepers will...

Learn how to think like a bee

Learn why bees are the most amazing creatures ever!



# POP QUIZ!

## Do bees have bones?

- Exoskeleton of chitin - glucose polymer, covered in wax –
  - Don't lose water, and don't grow

## Do bees have blood?

- Open circulatory system - no veins - hemolymph

## Do bees have lungs?

- Breathe through a complex structure of network of tracheas and air sacs

## Do bees have brains?

- pretty sophisticated - sensory input and processing, short term and long term memory formation.



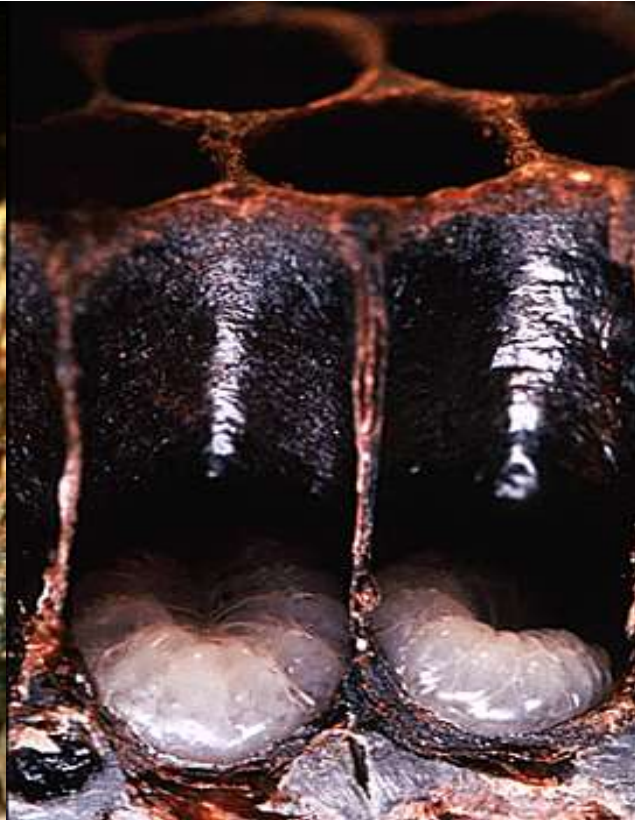
# WORKER BEES: MORPHOLOGICAL DEVELOPMENT

days since egg-laying

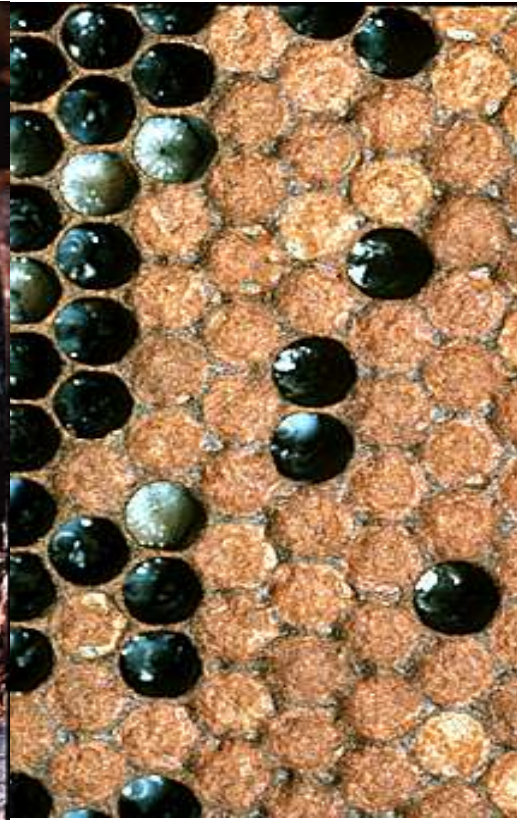
1 - 3



4 - 8



9 - 20



21

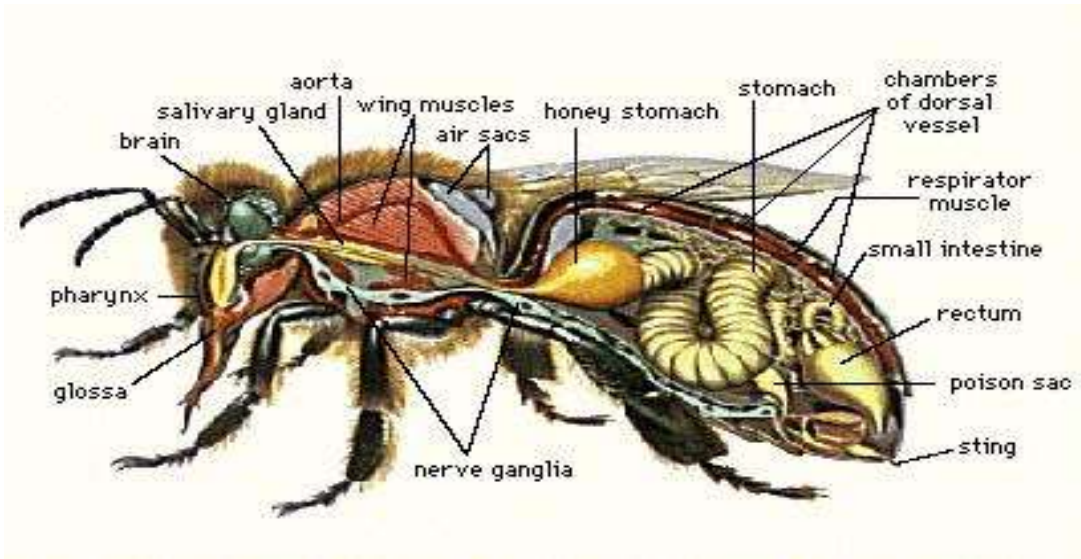


# THREE MAJOR PARTS: HEAD, THORAX, ABDOMEN

Head = Sensory

Thorax = Locomotion

Abdomen = Digestion and other business



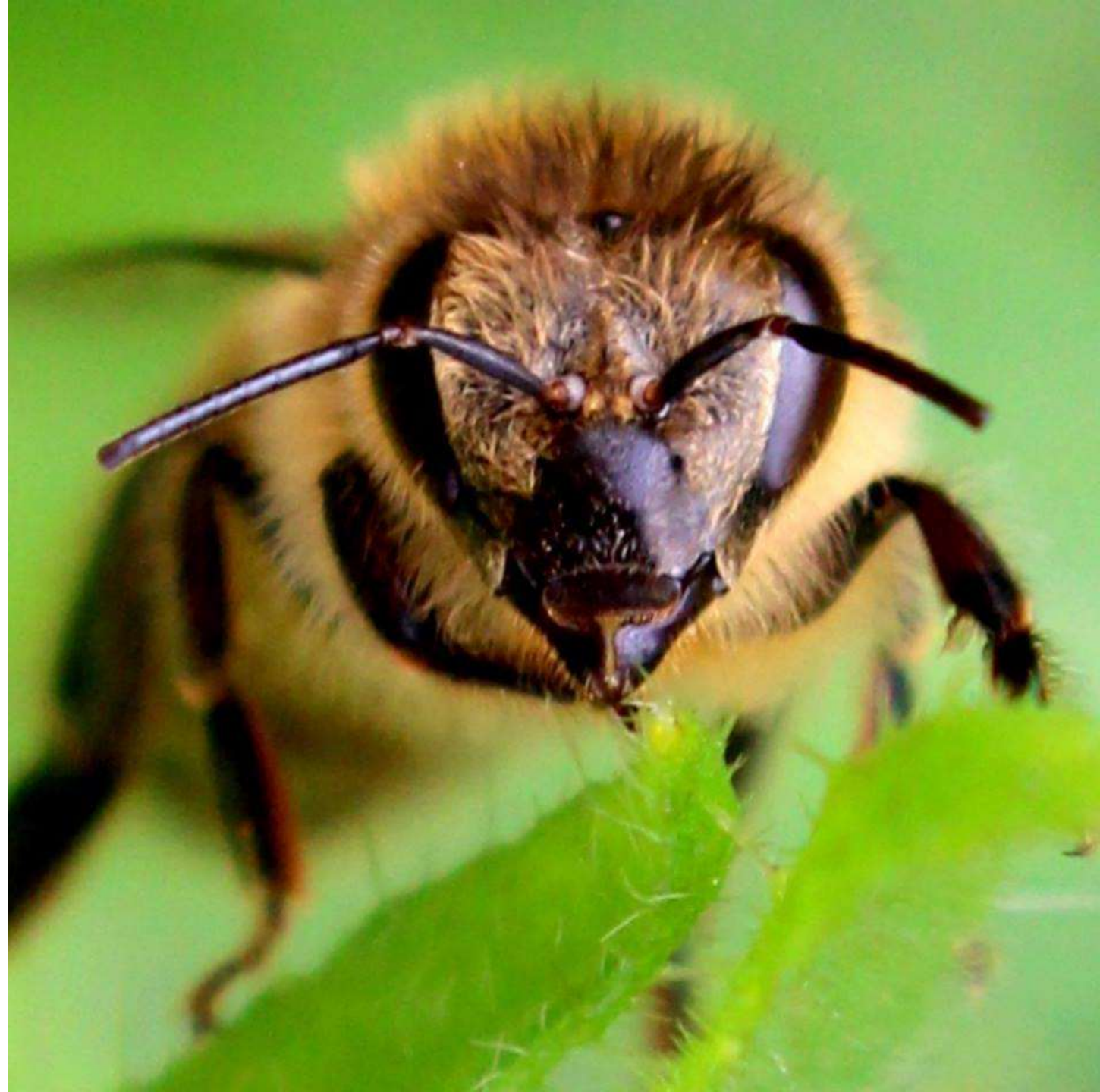
# HEAD

Think about all the types of information that they receive and process.

*\* Bees do not process the world the same way that we do – understanding how they perceive and respond to their environment is imperative to their care*

## **What is it like inside a bee hive?**

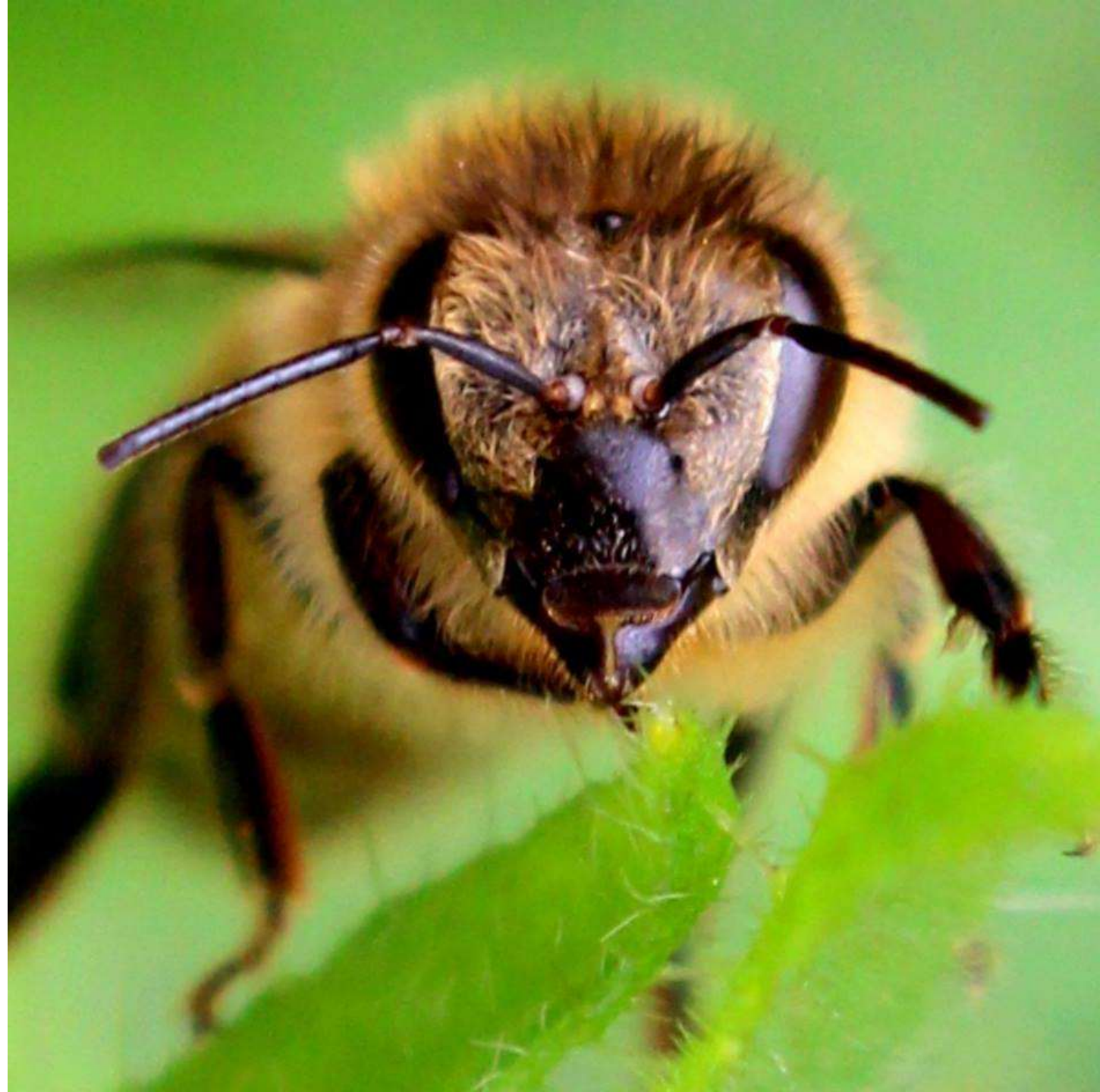
- Hive is dark - smell and touch are very important



# HEAD

Antennae - 1000s of sensory organs - for touch, smell and taste, even kind of hear - sensing air movement

Mouth parts - combined both mandibles and a proboscis - Can chew and suck (grasshoppers can chew, moths can suck)



# HEAD - EYES

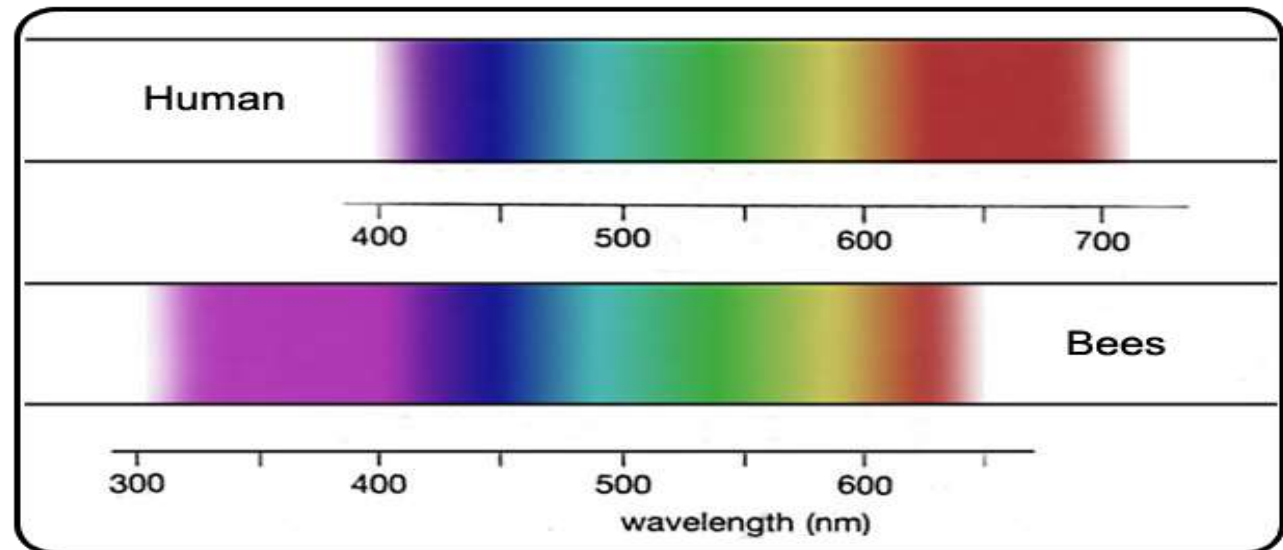
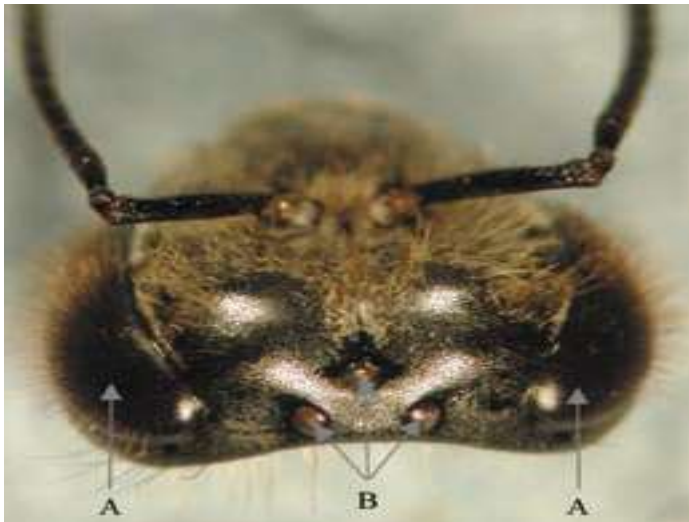
Two compound eyes - individual cells - light focusing elements (rods and cones) and light sensing cells (retina)

- Don't see high resolution images like our eyes, but a mosaic image - good for motion detection.

Three simple eyes - ocelli

- don't focus but provide information about light intensity.

See different parts of the spectrum – why is this important?



# THORAX

**Thorax - Center for locomotion**

Spiracles for letting in air

2 pairs of wings

3 pairs of legs



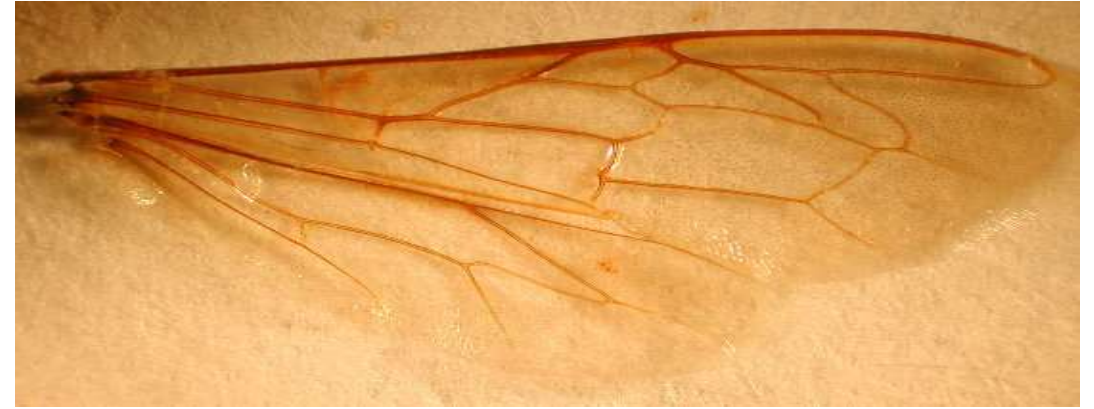
# THORAX - WINGS

## Wings

2 pairs – hooked together

Powered by two sets of muscles in the thorax –

- Longitudinal and vertical
- Fulcrum like structure at base
- Flight muscles can contract several times on a single nerve impulse
- Winter- detach wings and contract muscles for heat





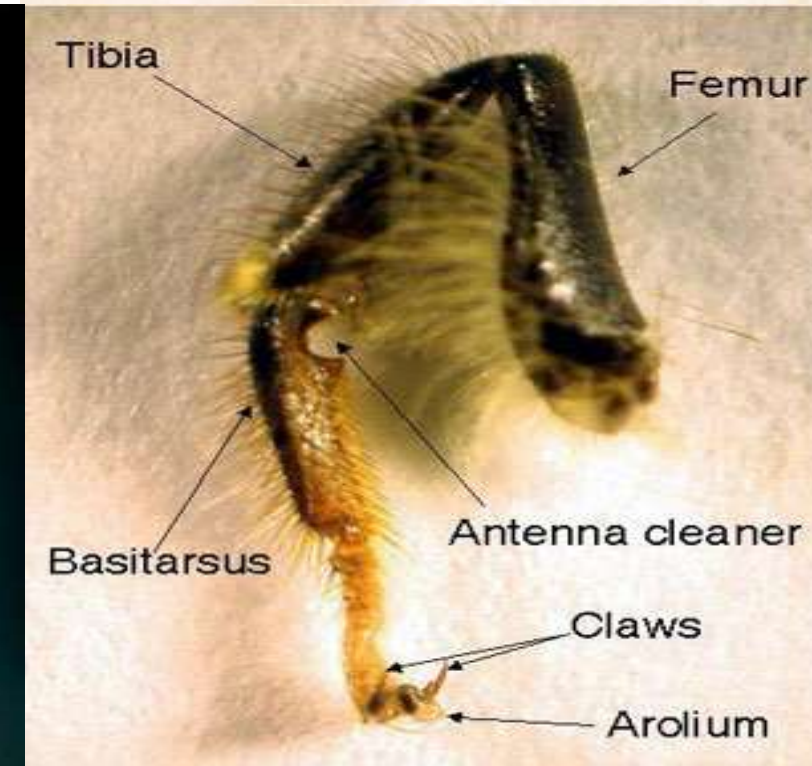
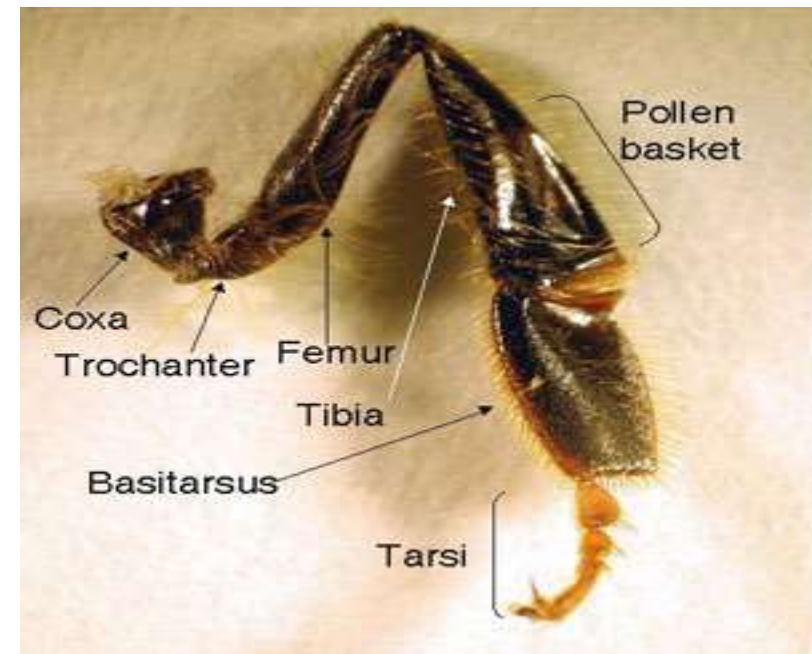
# THORAX - LEGS

Very versatile

- Claws— good grip on rough surfaces
- Soft pad —walk on smooth surfaces (glass)

Pollen basket

Front legs — special structure for cleaning antennae



# ABDOMEN

Sting only external structure

Has barbs – prevents pulling out – breaks off and left behind

Part of digestive system

The sting, venom gland, and muscles will work autonomously to pump venom into the victim

Alarm pheromone released – mark victim



# ABDOMEN - DIGESTIVE TRACT

## Esophagus

## Crop (honey stomach)

- Can expand (nearly 1/2 abdomen in successful forager)
- Proventriculus – valves and teeth – remove pollen grains in nectar and stop backflow of food

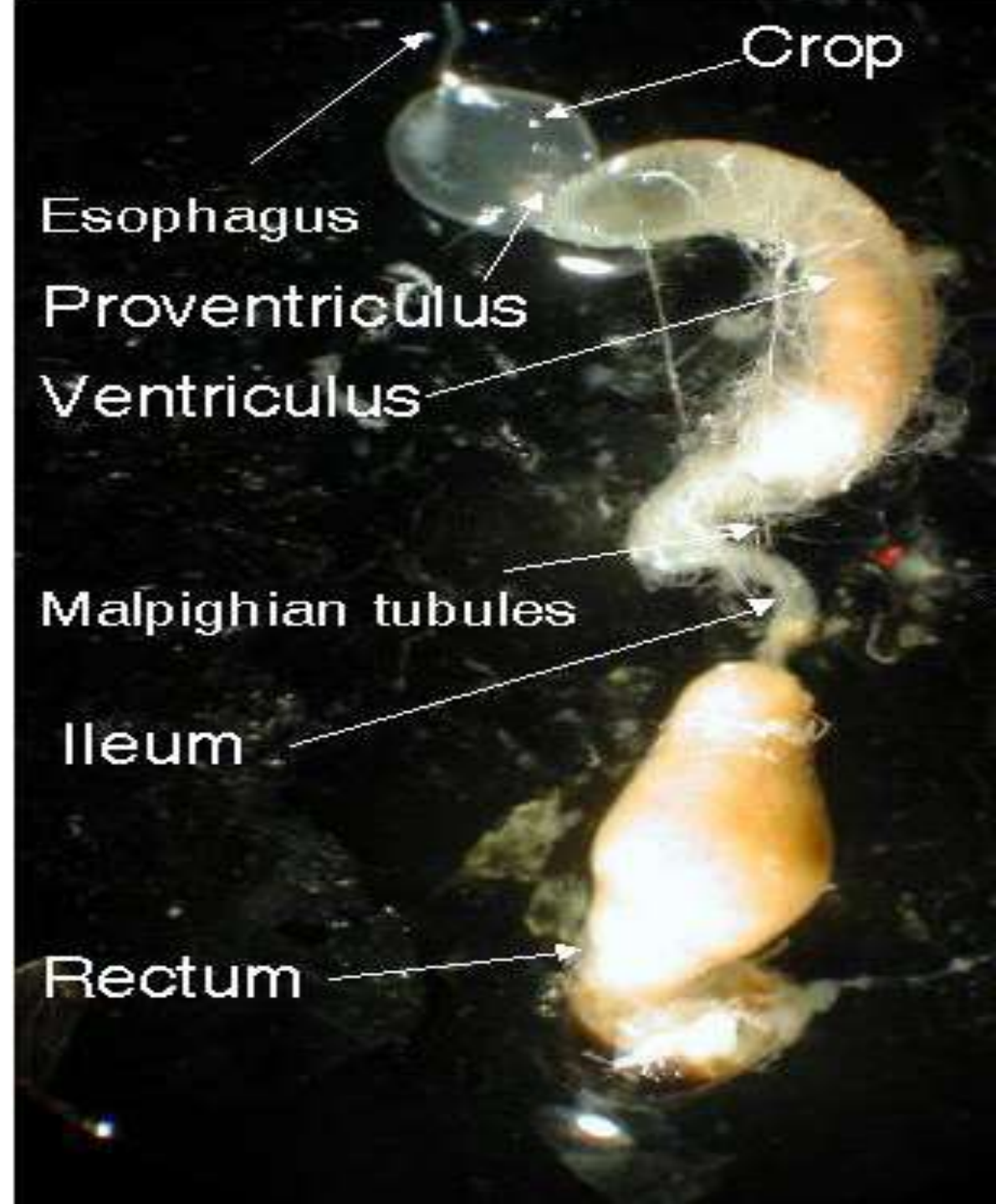
## Midgut (stomach)

## Malpighian tubules – function like kidney

- Removes nitrogen waste (uric acid crystals)

## Intestine / rectum

- Expandable - chitin layer – can hold it.



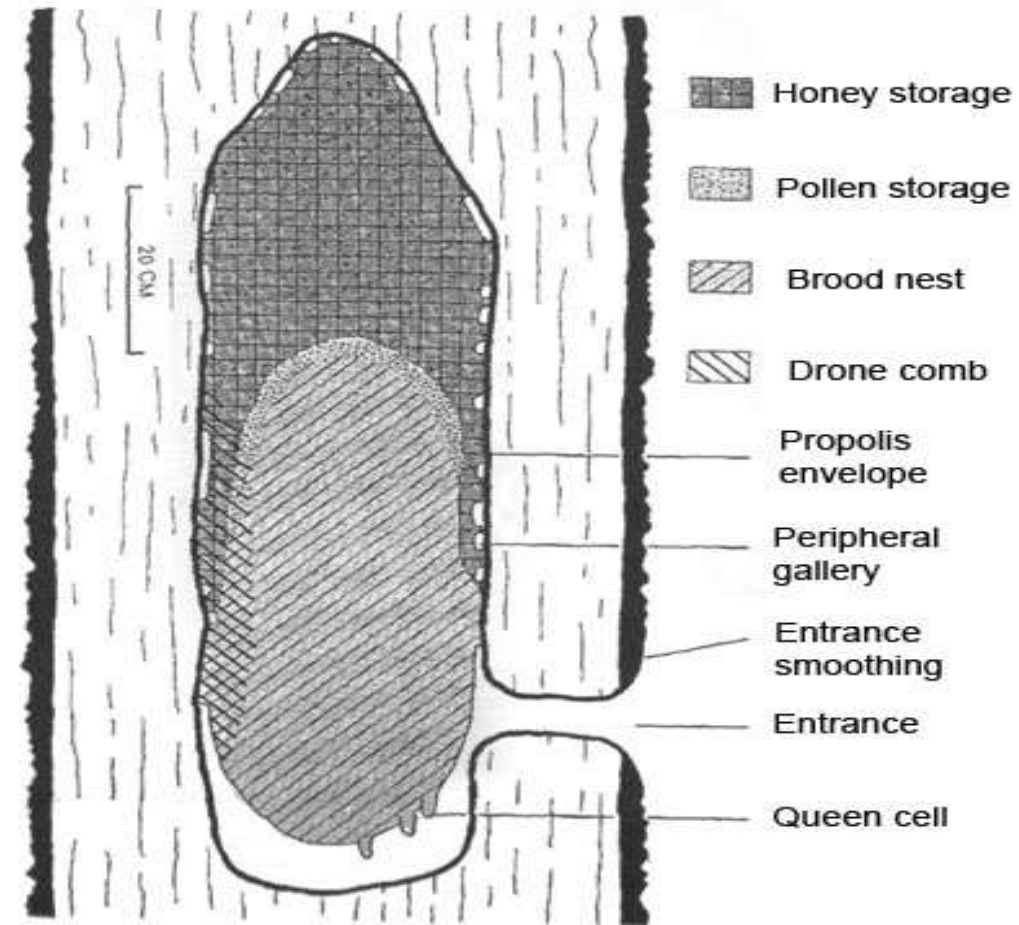
# GLANDS - WAX

Workers 6-12 days old can produce wax scales

Workers chew them and add saliva – becomes more whitish



# COLONY / SUPER ORGANISM BIOLOGY



# COLONY / SUPER ORGANISM BIOLOGY



**Worker**



**Queen**

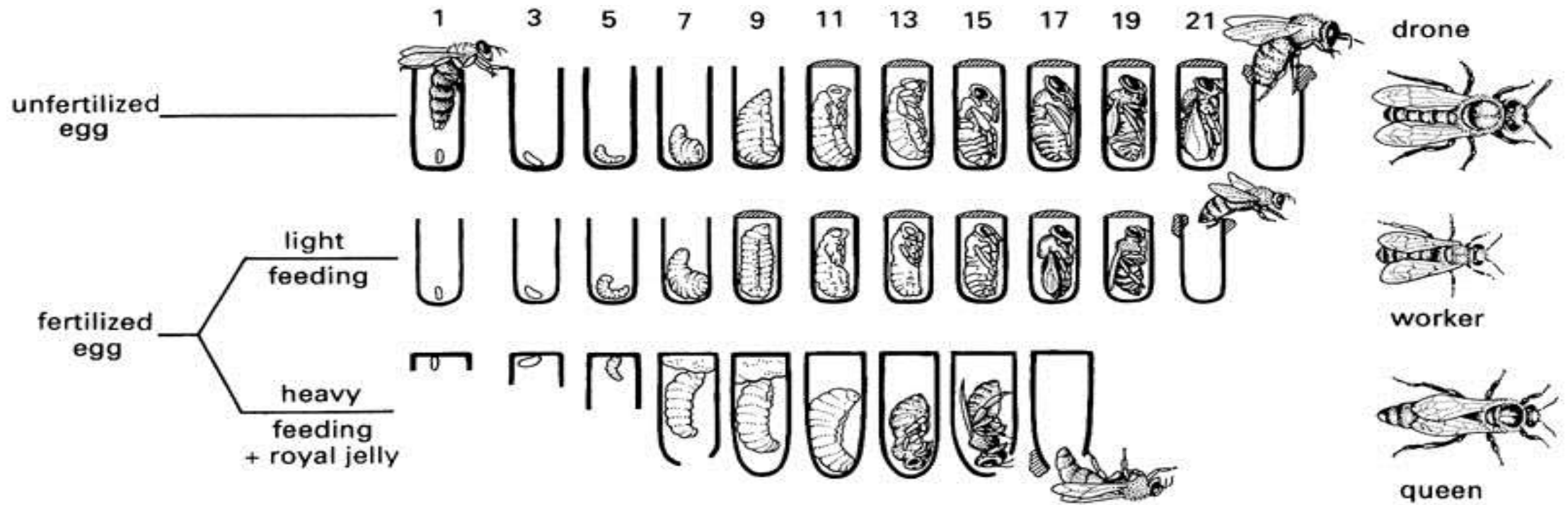


**Drone**

© [alexanderwild.com](http://alexanderwild.com)



# HONEY BEES – CASTE SYSTEM



# THE COLONY



## Worker

The Everybee

- 21 Days from Egg to Adult





# Age-Related Activities of Workers

First 2 days:

- cell cleaning

3-10 days:

- queen care

- nursing (feeding young)

- wax work

15-20 days:

- wax work

- nectar processing

- guarding

- undertaking

21-35 days

- foraging (water, nectar, pollen, propolis)

- colony defense



# THE COLONY



## Drone

The Gigolo

- **24 Days from Egg to Adult**
- **Gets Down to Business.**
- **And That's it.**



# THE COLONY

## The Queen Mother

One of a Kind



- **15-16 Days from Egg to Adult**
- **Lays up to 2,000 Eggs in a Day**
- **Lays about 200,000 Eggs in a Year**
- **Lays about ½ Million in Her Lifetime**
- **Average Lifespan is 2-3 Years**
- **Only Bee Who Can Lay Female Eggs**



# QUEEN REPRODUCTION

- **Supersedure**
- **Swarm**
- **Emergency**



# QUEEN REPRODUCTION



- **Supersedure**
  - Mated Queen Lays in Queen Cups
  - Workers “Ball” Mated Queen Before Virgin Queen Emerges
  - Daughter Queen Fights Mated Queen
  - Rare Coexistence

# QUEEN REPRODUCTION



- **Swarm**
  - Plethora of Resources & Bees
  - Mated Queen Lays in Queen Cups (edges of brood)
  - Slows Down Laying 10 Days Before Virgin Queen's Emergence
  - Mated Queen Leaves with 41-80% of the Colony
  - Virgin Queens Fight it Out

# QUEEN REPRODUCTION



- **Emergency**
  - Beekeeper Error
  - Disease or Pest Mortality Event
  - Workers Draw Out a Worker Bee Cell

# THE COLONY

## The Queen Mother

The Coronation







**QUESTIONS?**





[www.beegirl.org](http://www.beegirl.org)