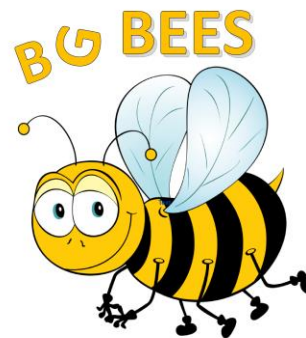


# HONEY BEE NUTRITION



# TRIFFECTA



## THREE LEGGED STOOL

**Three legs and three style offerings: 1) Presentations, 2) Round Table Discussions, and 3) 'in hive' Experience.**

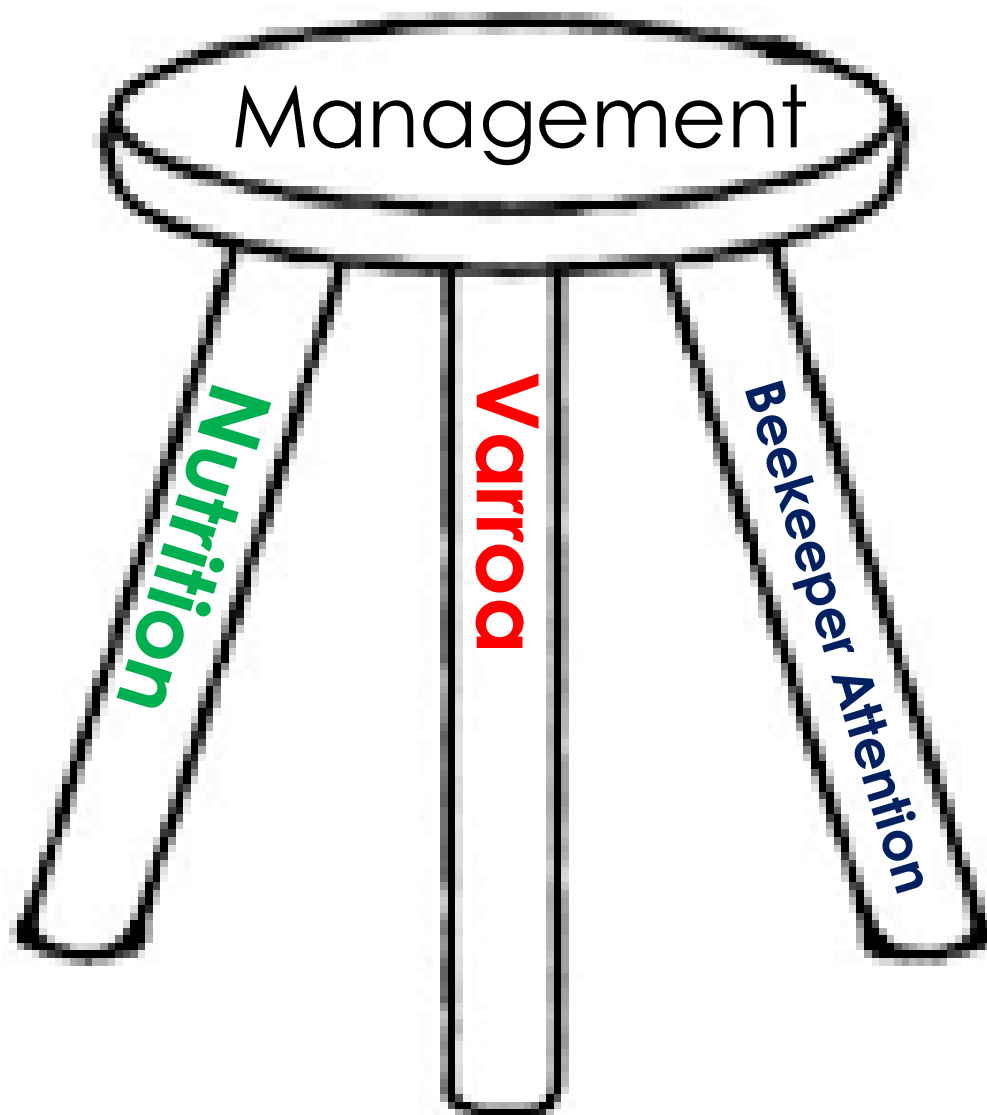
**Each of you will delve into the life of the honey bee. Taking:**

- **the didactic presentation materials**
- **to a discussion table,**
- **translating the information into practical management of your colonies.**

**Finally, you will have an opportunity to delve into a honey bee colony to assess the needs, the health and what issues may arise in the near future.**

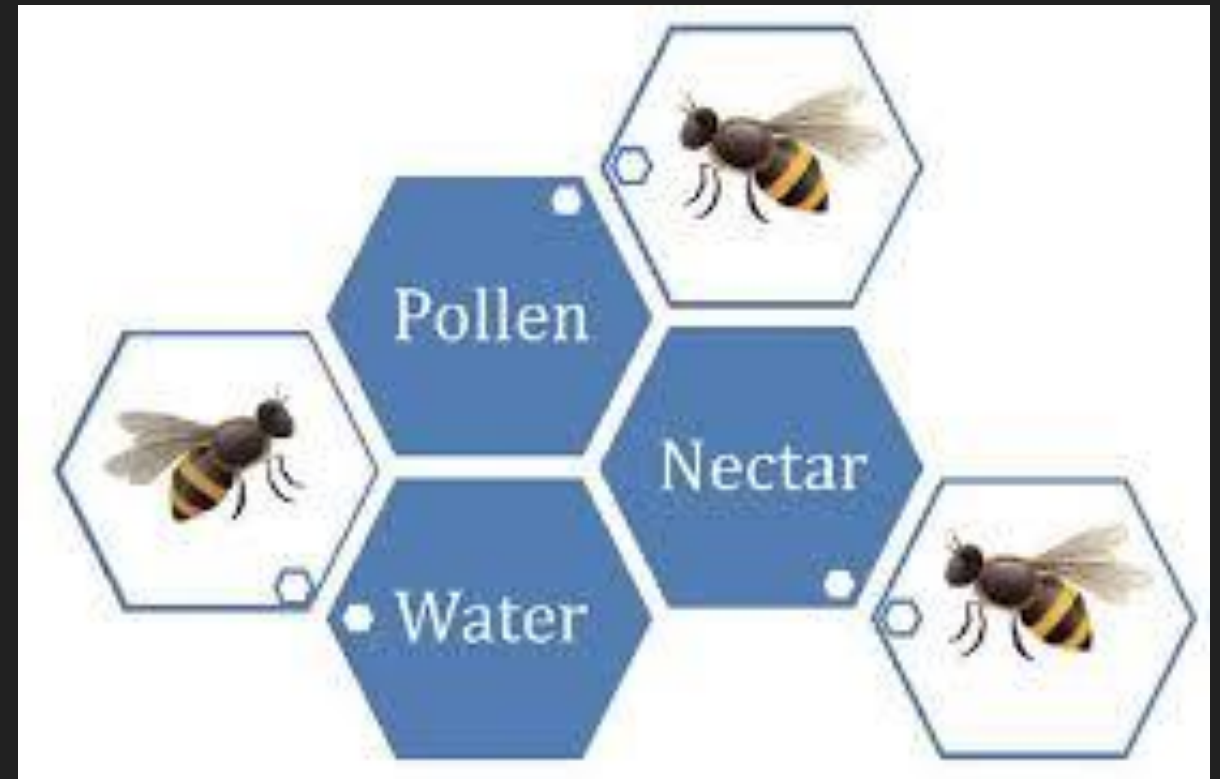
# BAKING





# COLONY NEEDS - ANNUALLY

- Nutrients from over 250 million flowers
- 35 to 75 pounds Pollen
- 120 pounds honey
- 22 gallons water





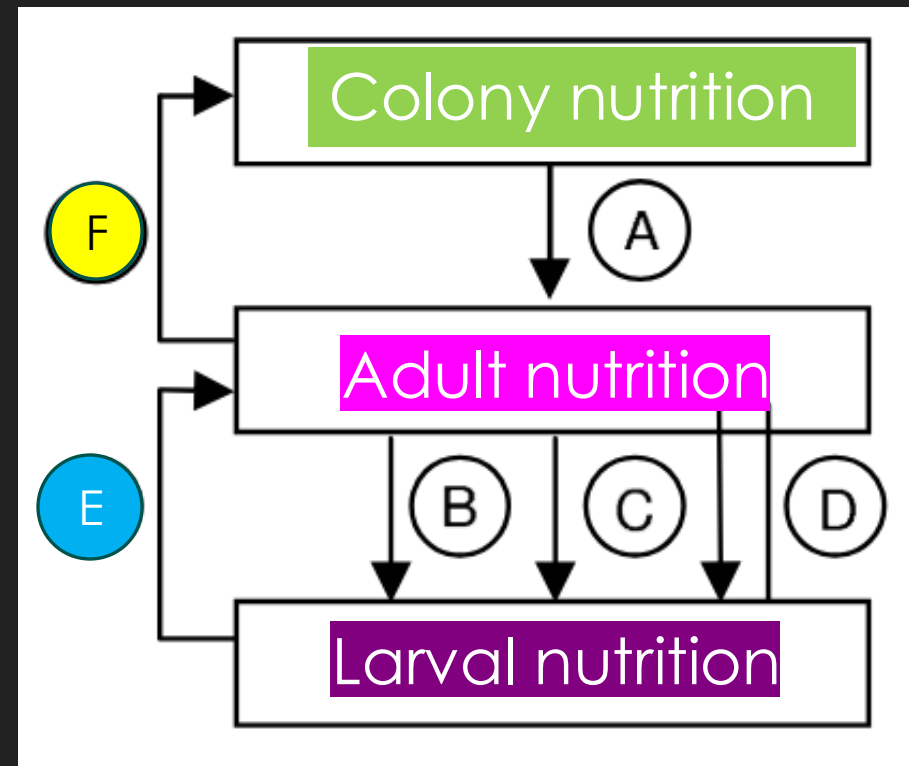
# NECTAR

- With a body weight of about 0.1g, a honeybee can carry nearly half of its body weight in nectar!
- A forager flies out to collect nectar 7-13 times a day,
- During Nectar Flow as many as 24 times a day,
- 10,000 worker bees need to make 4 trips to produce 2.2 pounds of honey.



# NUTRITIONAL NEEDS

- A** dependency of adults on colony food stores;
- B** investment in larval quality;
- C** regulation of larval number;
- D** cannibalism;
- E** impact of larval nutrition on next adult generation;
- F** impact of adults on colony nutrition.



# COMPLEXITY OF BEE NUTRITION

- Colony
- Adult
- Larvae





# AMINO ACIDS

## What do amino acids do?

**Break  
down  
food.**



**Grow and  
repair body  
tissue.**



**Make  
hormones  
and brain  
chemicals.**



**Provide  
an energy  
source.**



**Maintain  
healthy skin,  
hair and  
nails.**



**Build  
muscle.**



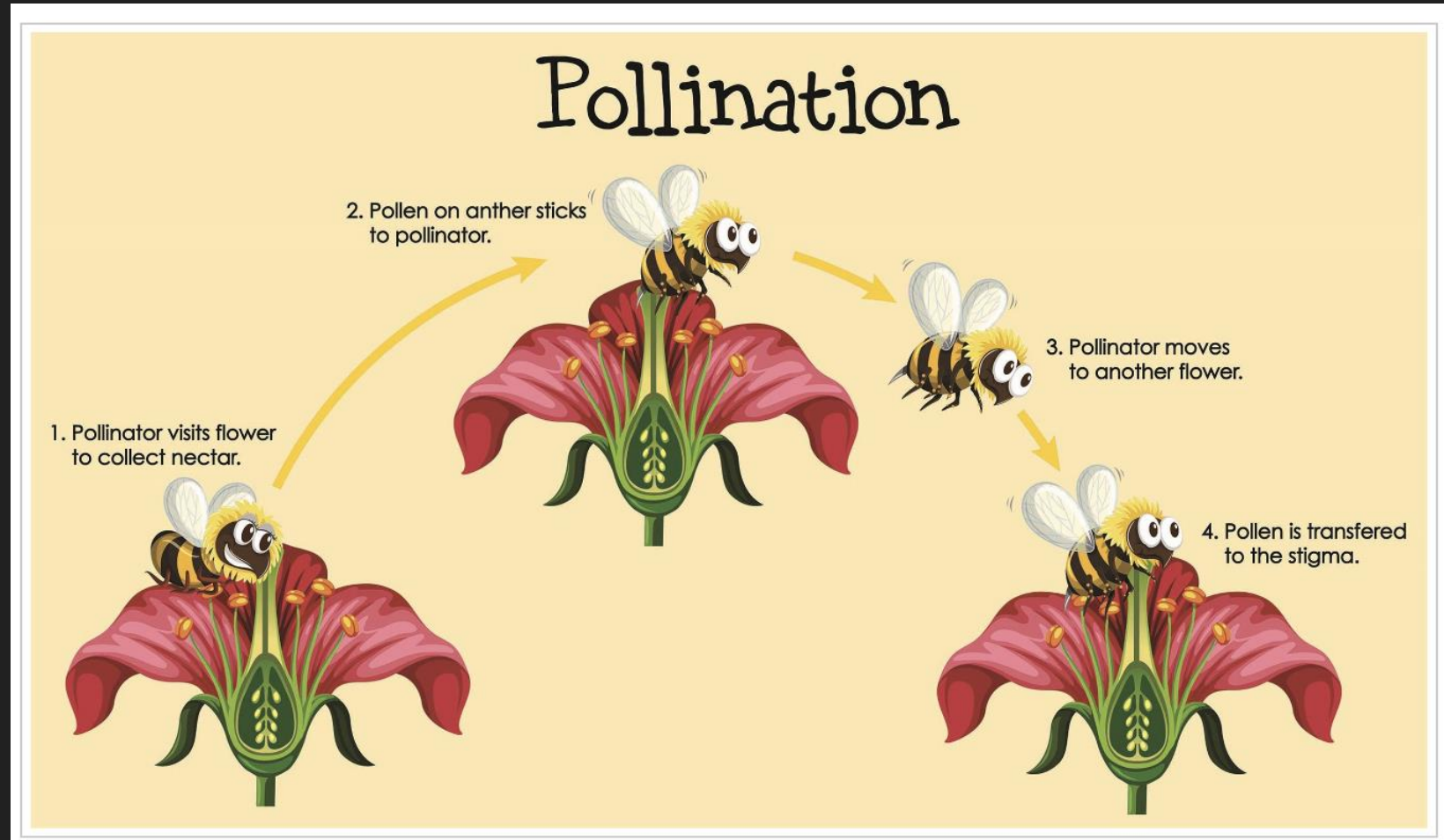
**Boost your  
immune  
system.**



**Sustain  
a normal  
digestive  
system.**



# FLOWER SEX



# NECTAR

Sucrose Sugar – high level

Trace:

Fructose

Glucose

Minerals

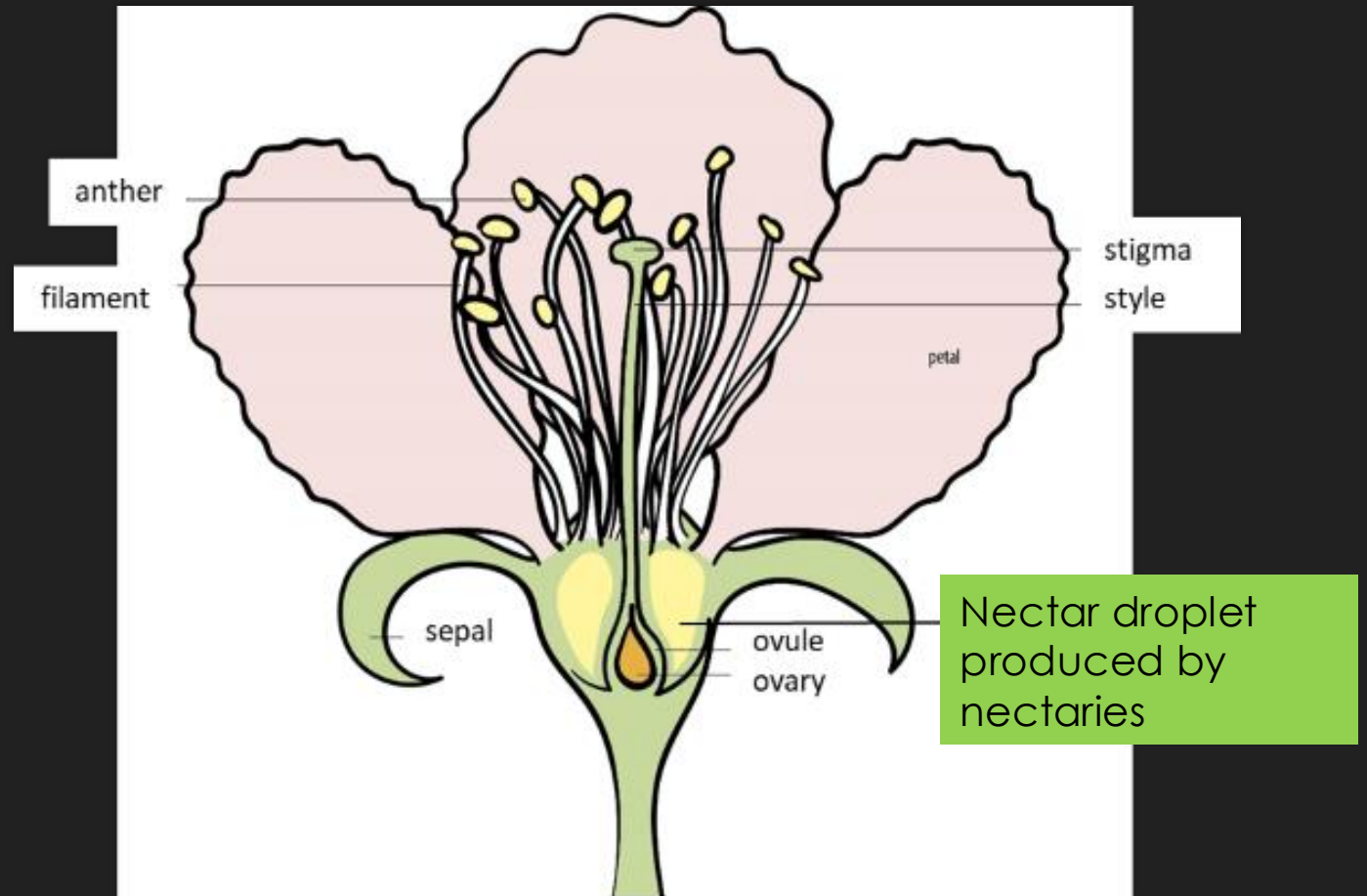
Vitamins

Pigments

Aromatic substances

Organic acids

Nitrogen compounds



# STORE POLLEN

- Store about 2.2 pounds bee bread near brood





# POLLEN VITAL

- Brood Production
- Development young bees

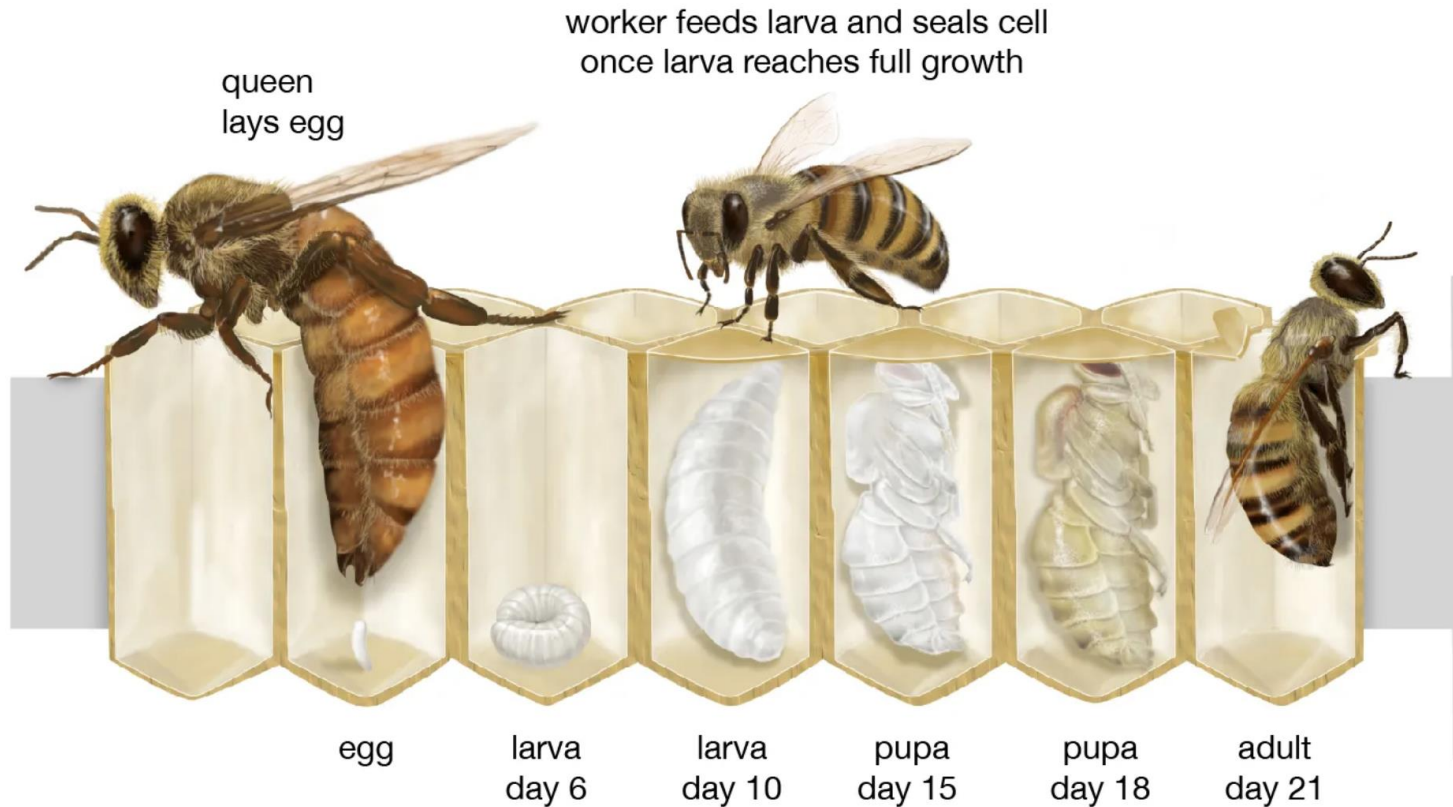




# LARVAE FEEDING

- Worker & Drone Larvae
  - Royal Jelly Day-4 and Day-5
  - Bee Bread Day-6 to Day-9
- Queen
  - Royal Jelly Day-4 to Day 9

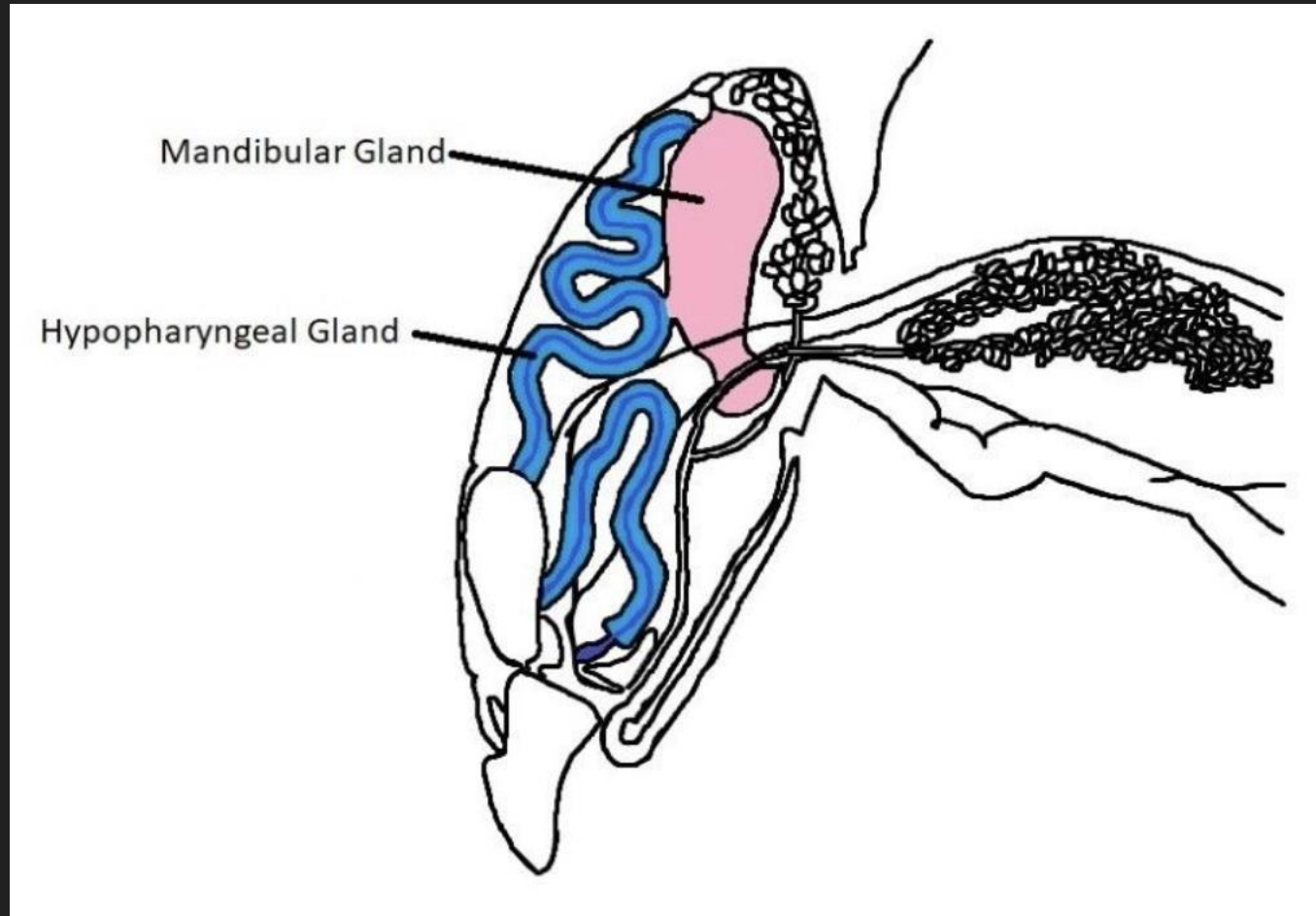
## Life cycle of honeybees



# HYPOPHARYNGEAL & MANDIBULAR GLANDS

## ○ Nurse Bees (3–15 days old)

- Hypopharyngeal and mandibular glands grow and develop in their mouths to make royal jelly.
- Make and feed **royal jelly** to worker and drone larvae for their first two days after hatching from an egg into larvae
- Make and feed **bee bread** to worker and drone larvae.
- Visit and care for each larva over 10,000 times and feed them over 1,000 times before the cell is capped or covered with wax.



# ROYAL JELLY

- 67% water,
- 12.5% protein,
- 11% simple sugars (monosaccharides),
- 6% fatty acids
- 3.5% 10-hydroxy-2-decenoic acid (10-HDA).
- Also contains trace minerals, antibacterial and antibiotic components, pantothenic acid (vitamin B5), pyridoxine (vitamin B6) and trace amounts of vitamin C,<sup>[2]</sup>





# BEE BREAD

Bee bread is a natural product obtained from the fermentation of bee pollen mixed with bee saliva and flower nectar inside the honeycomb cells of a hive



Currently, the relationship between the species diversity of pollen-producing plants and the metabolism of flower-visiting insects is still insufficiently understood

"For to the bee a flower is a fountain of life, And to the flower a bee is a messenger of love, and to both, bee and flower, the giving and the receiving of pleasure is a need and an ecstasy."

The Prophet Kahlil Gibran



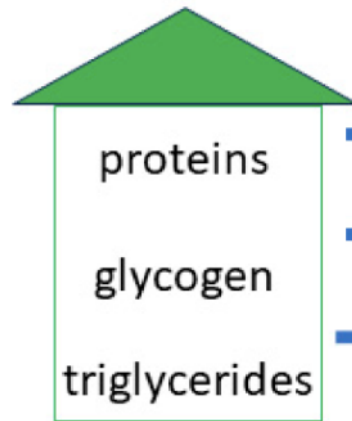
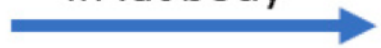


# NUTRITIONAL BALANCE



well-balanced  
pollen diet

concentration  
in fat body



energy for flight



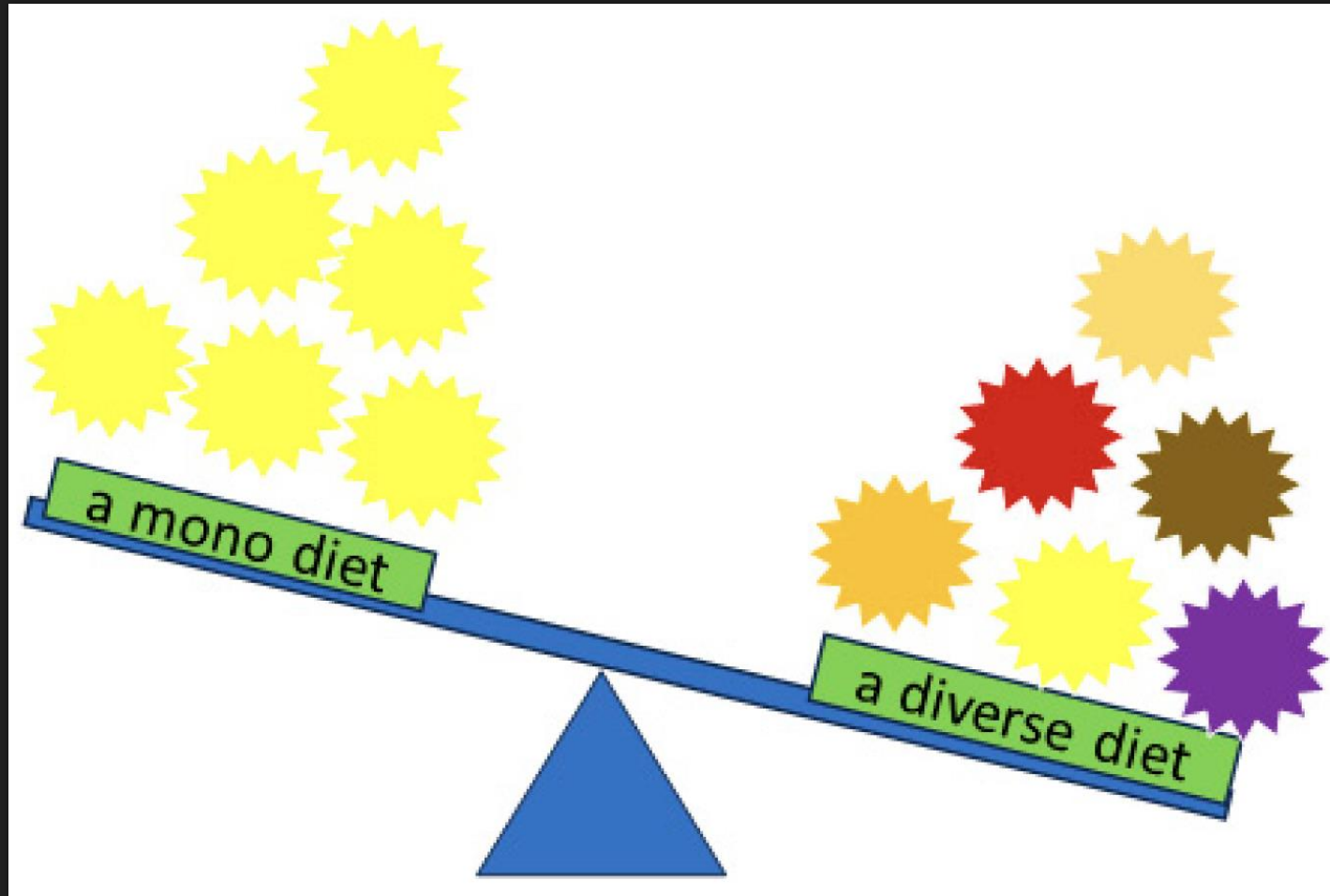
correct wintering



effective immunocompetence

} strong  
bees

A diverse pollen diet contains different amino acids than a mono diet



# BEE BREAD

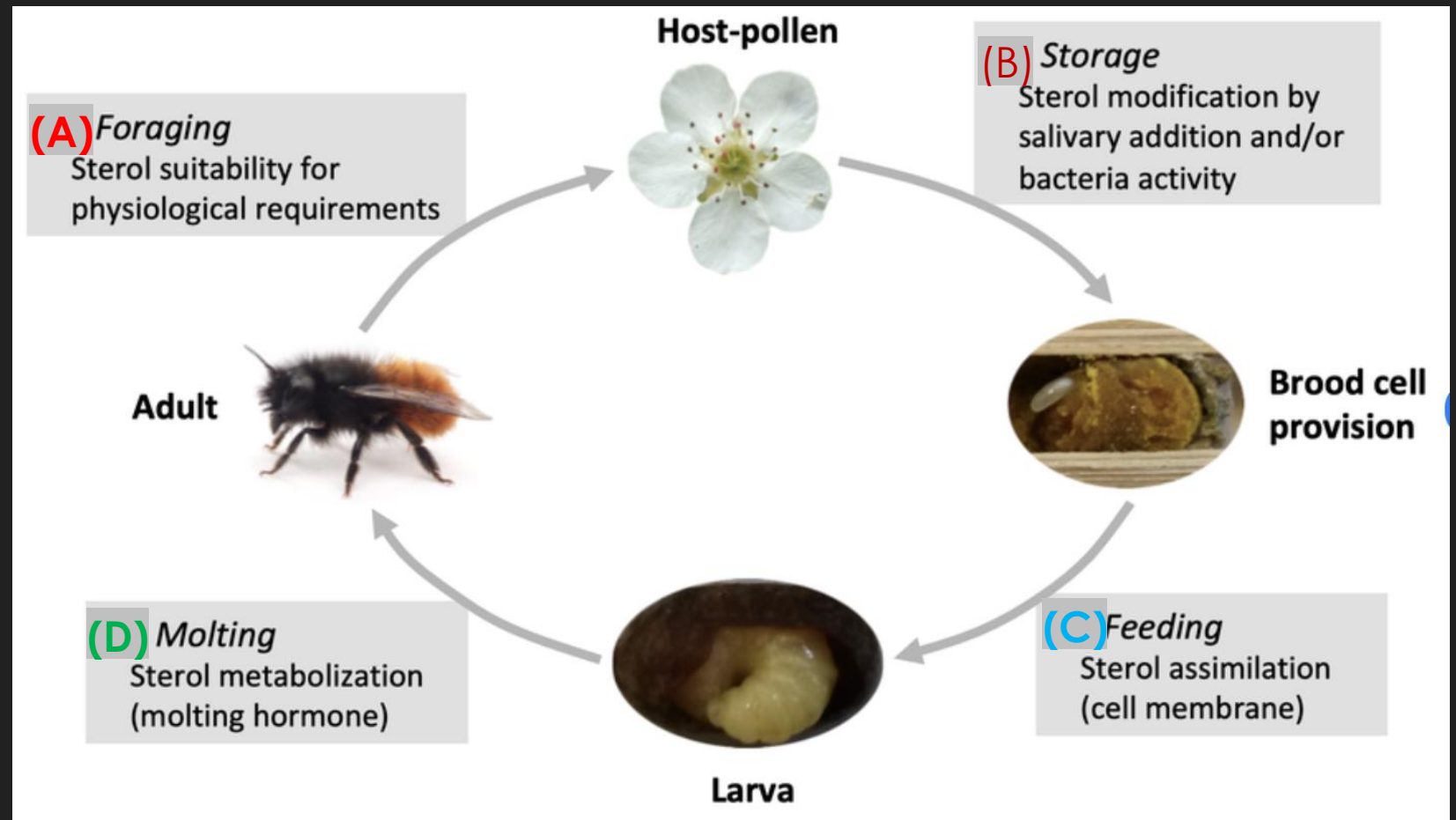
Bee bread has a higher nutritional value, mainly due to the greater bioavailability of amino acids caused by the action of lactic acid bacteria supplied by the honey bee





# 24-methylenecholesterol (sterol)

A larva molts five times, meaning that there are 5 instar stages in a larva. The first four instars last about one day each. The 5th instar larva often is called the prepupae



# PHYTOSTEROLS

- Only available from Pollen
- 24-methylenecholesterol
- Key to instar molting





## 01 FROM FLOWER TO STOMACH

Foraging bees store nectar that will become honey in a specialized stomach. A valve in this honey stomach allows some nectar to enter the mid-gut if the bee needs energy to fly.



## 02 INVERTASE ADDED

The bee adds the enzyme invertase to the nectar to break it down into the easily digested sugars: fructose and glucose.



## 03 RECEIVERS TAKE CONTROL

Receiving bees suck out nectar from returning bees. They then add more enzymes to help break down the nectar.



## 04 DROPPED INTO CELLS

Two or more receiver bees that are loaded with nectar place a drop into a cell.



## 05 FANNING TO EVAPORATE

Worker bees fan wings over cells to reduce water content in new honey from 60-80% to 18% to preserve honey.



## 06 GLUCOSE OXIDASE ADDED

Oxygenase is added with the invertase to preserve honey.



## 07 SEALED IN WAX

Once filled with honey, a wax cap is built over the cell to keep honey fresh and available for a long time.

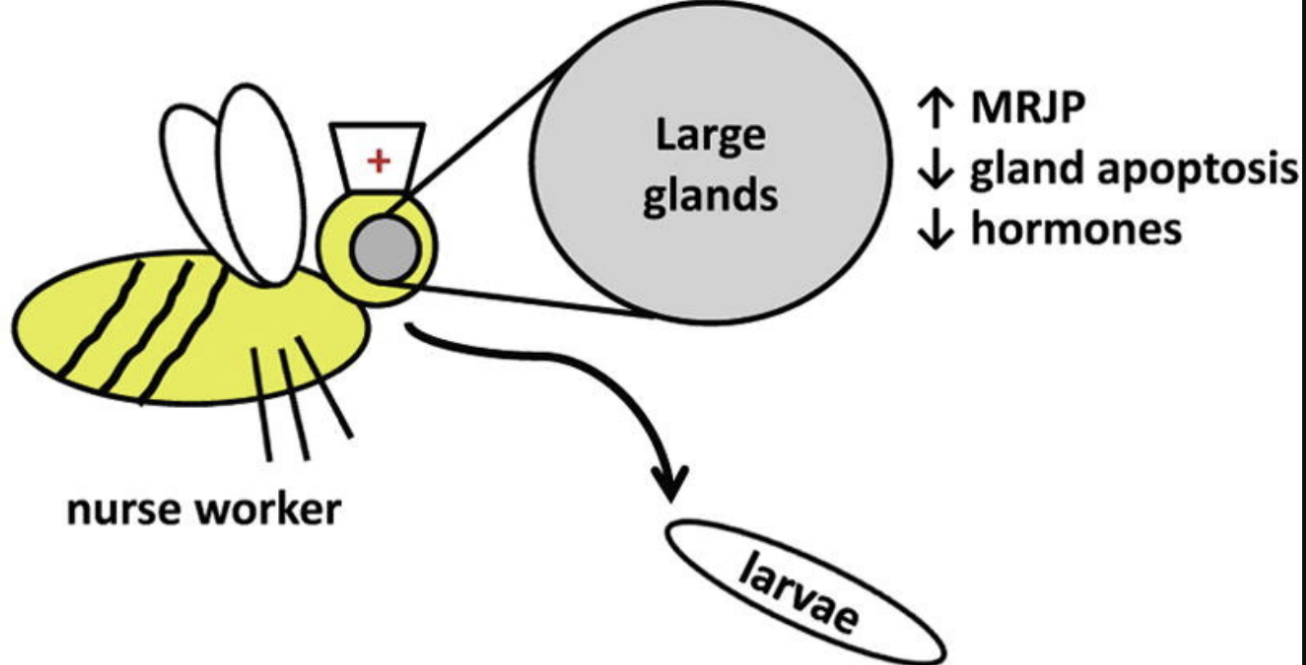


# NECTAR TO HONEY

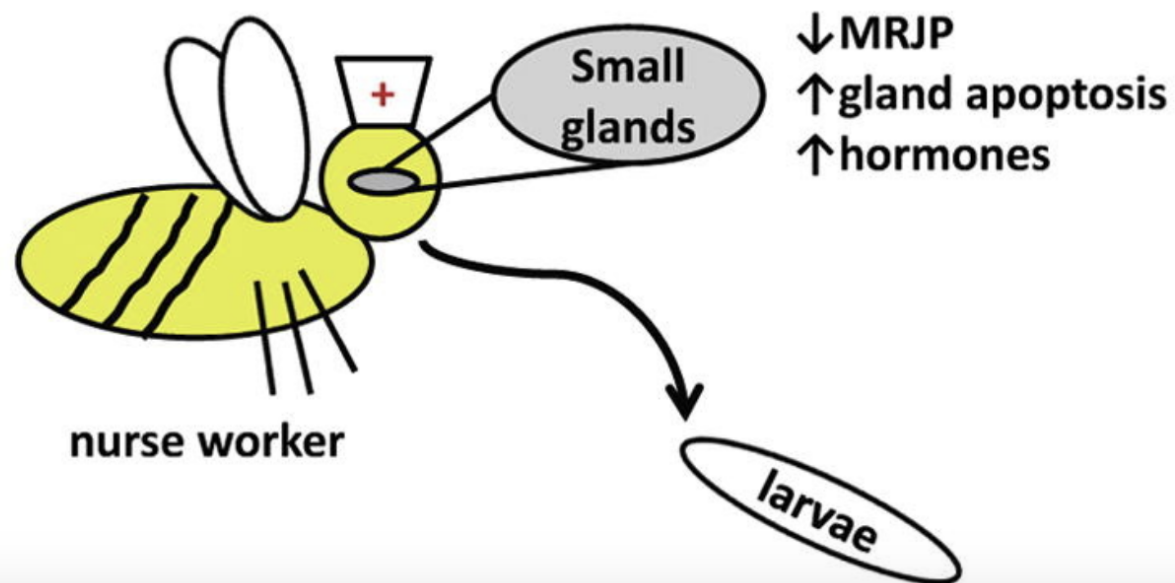
A Sweet Job

*Pollen*

abundant

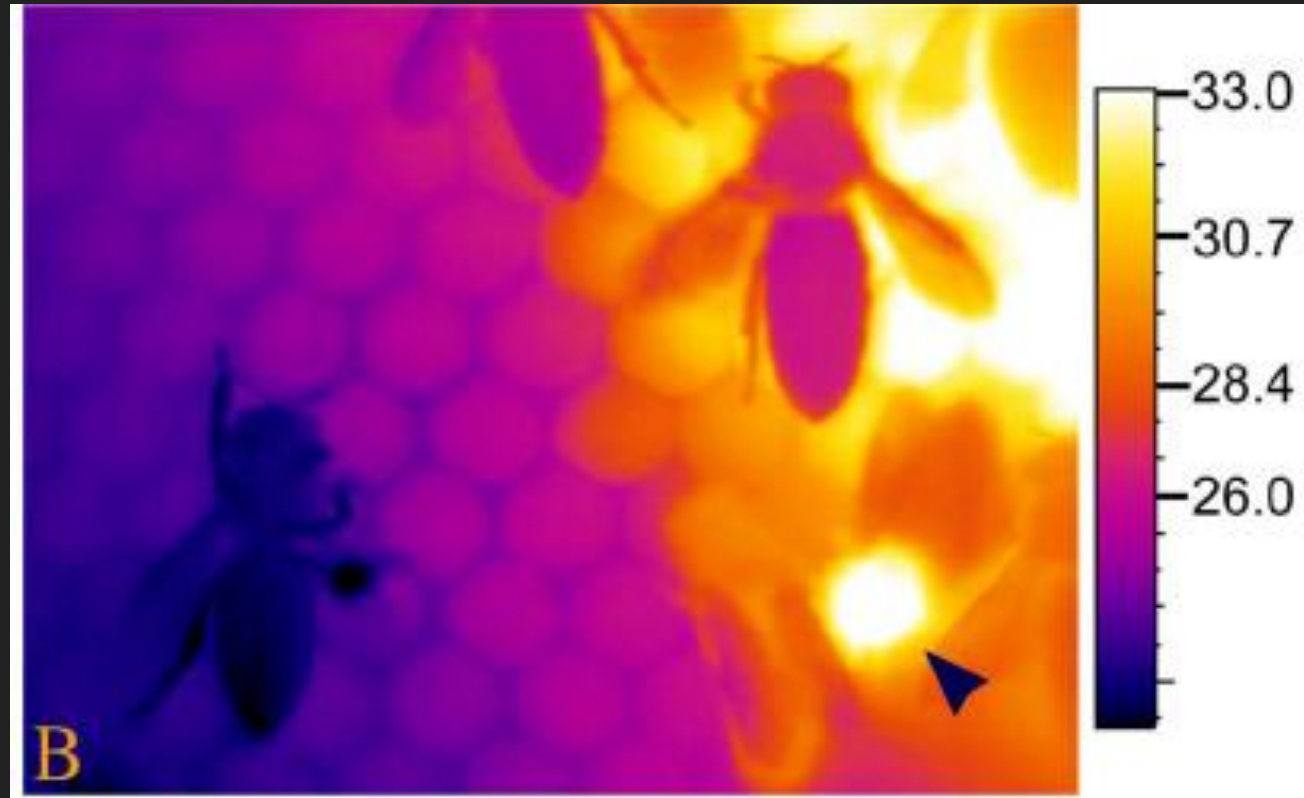


scarce

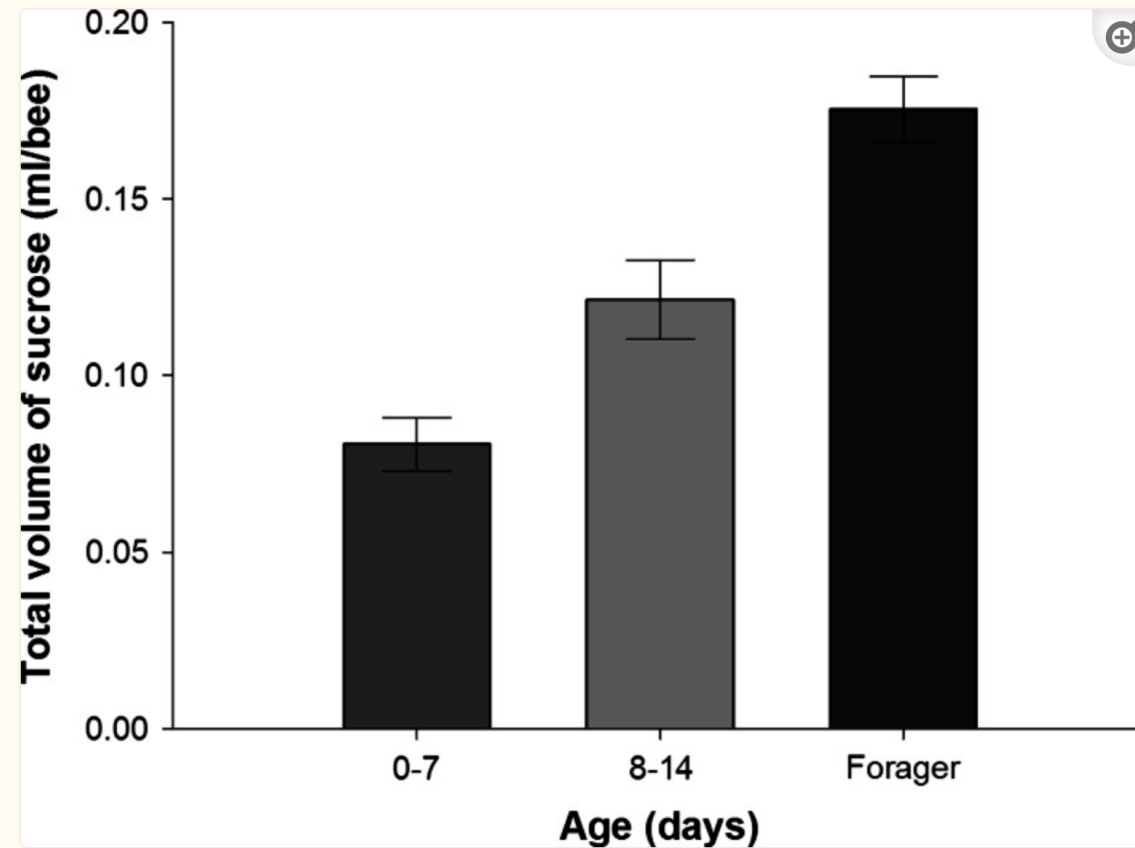


# HEATER BEES

- Heat individual cells
  - Nectar cells
  - Brood cells 95.9°



# DEMANDS FOR CARBOHYDRATES



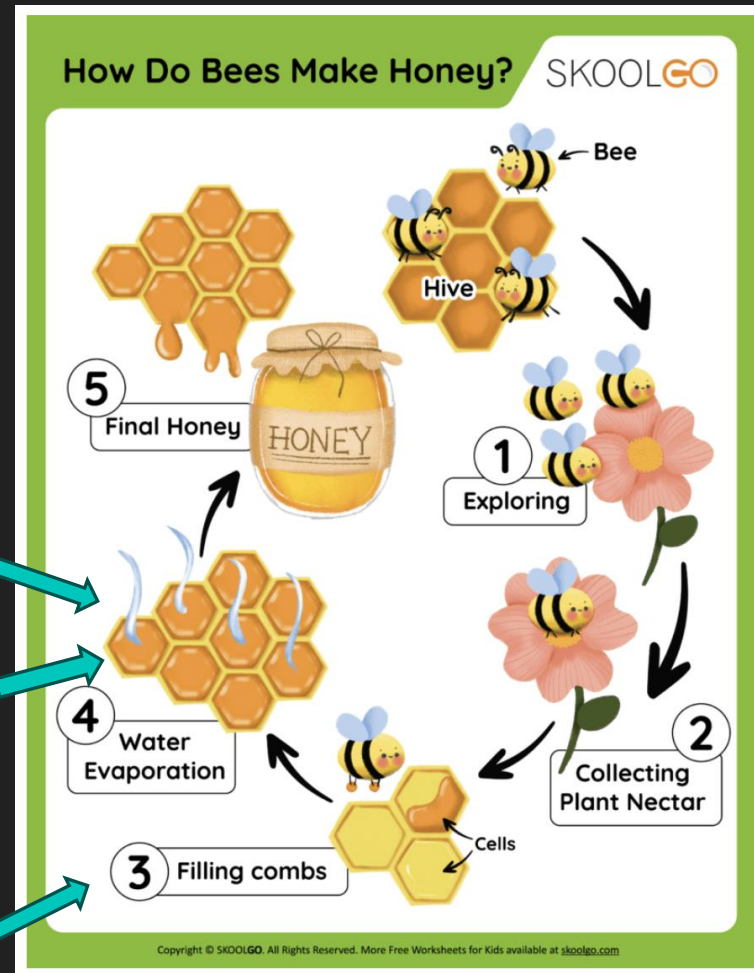
# NECTAR → HONEY

- Nectar – 75% Water
- Honey – 15% -19%

Heater Bees

Fanning Bees

Receiver Bees





# MICROALGAE

When mixed into bee food, the engineered algae boost the bee's immune system to fight off the targeted virus



# WATER

grab a pan or shallow bowl,  
and add a good amount of  
stones, pebbles or marbles  
before filling with water

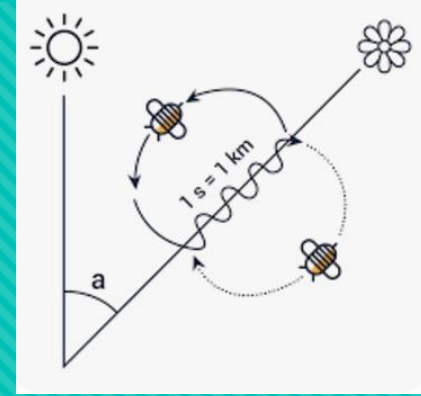
- Water from Nectar (30% - 85%)
- Honey – need to dilute
- Temperature regulation > 85°



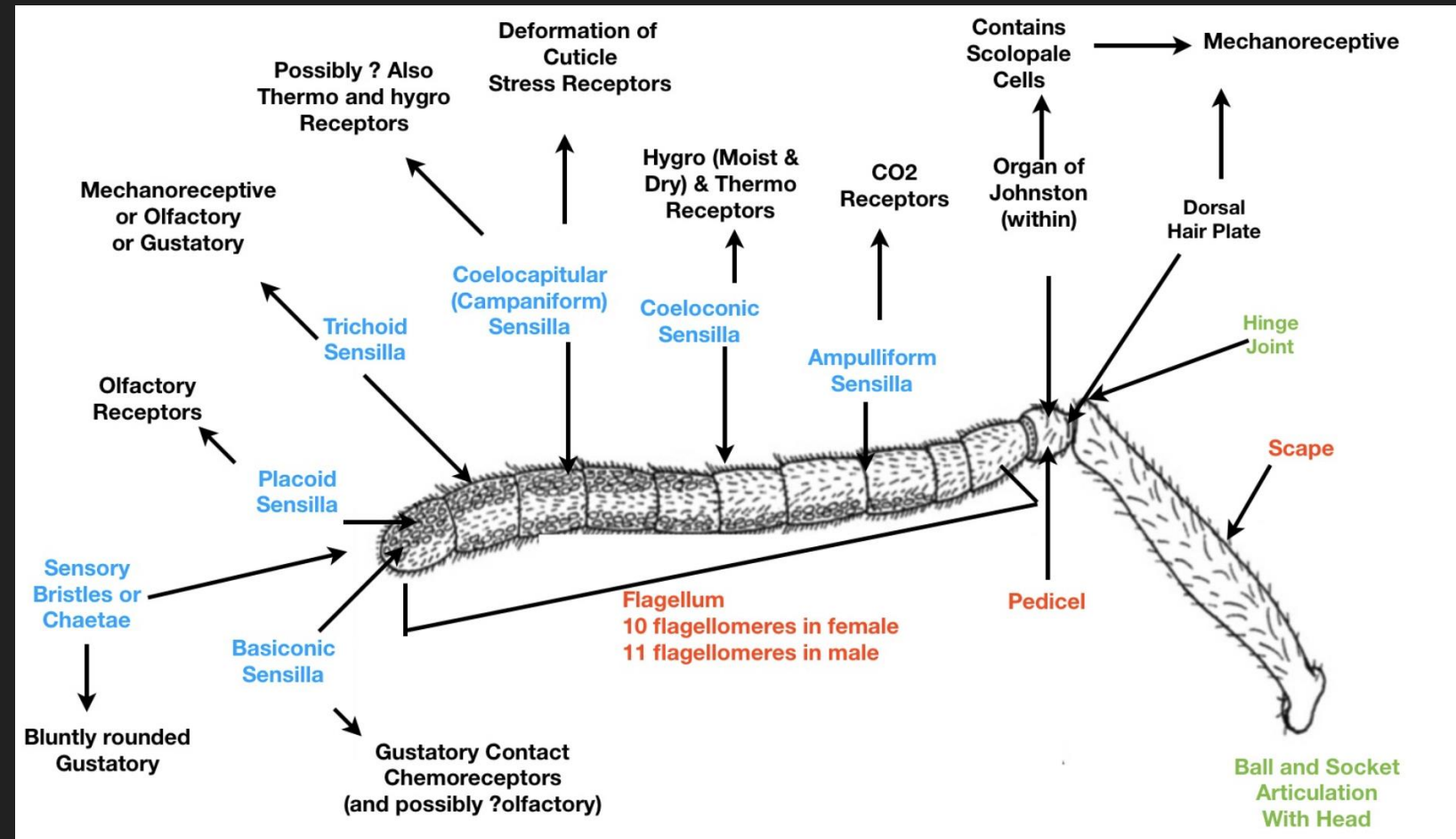
**Place within 100 feet**



# ANTENNAE



- Johnston's Organ - two antennae to hear, rather than to view the dance
- Dancer carries molecules of floral fragrance along with pollen particles on her body, both of which the attentive audience can smell via chemical sensors
- Evaluate the sweet reward





# FORAGING COLOR

- As forager nears, it is the color that attracts





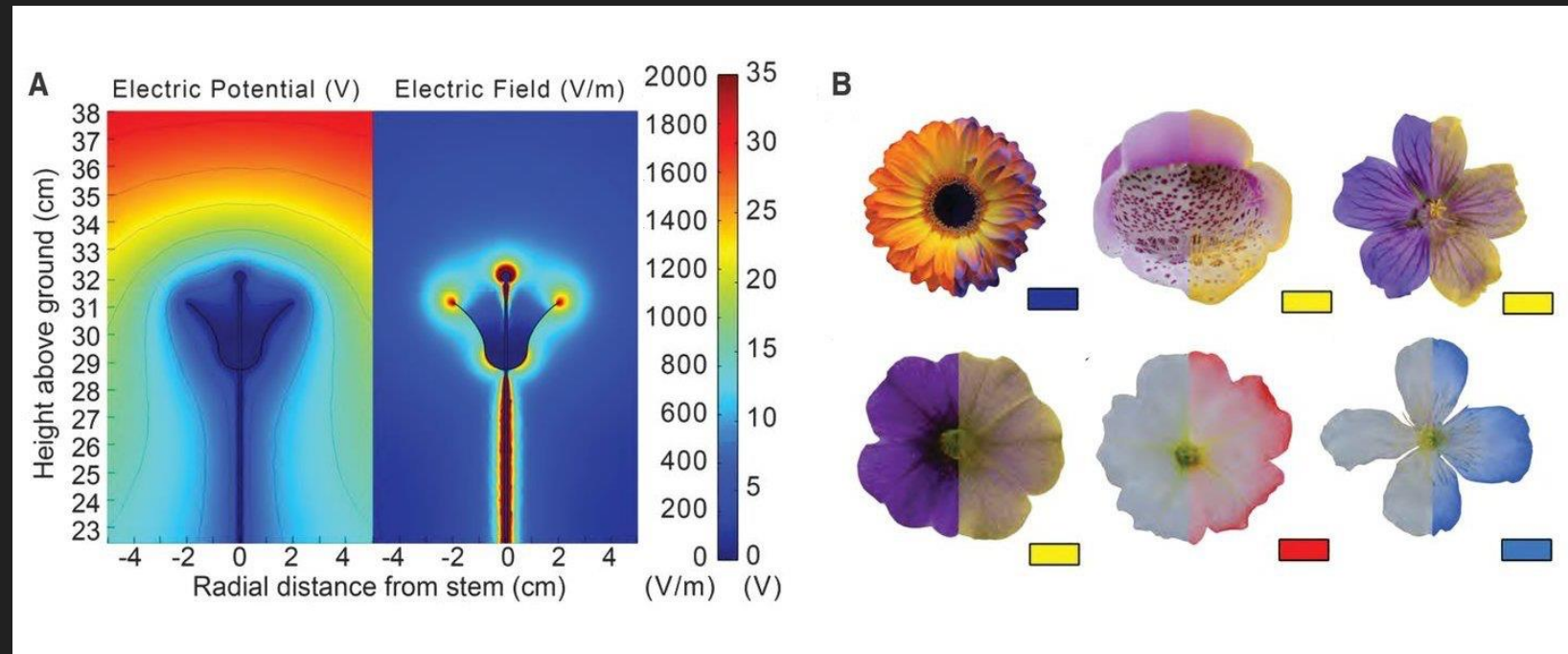
# FLOWER ATTACTION

- Color textures,
- Ultraviolet patterns in the petals of flowers,
- Odors,
- Local air humidity



# FLORAL ELECTRIC CHARGE

- Vertical electrical potential gradient of around 100 Volts/meter
- Similar to lightning rods
- Electrical field between the **positively charged (+)** bee and the **negatively charged (-)** flower
- Depletes the flower's nectar for some time
- Flower communicates to subsequent bees that there is no nectar left



# SMELL

- Bees are highly attuned to their environment, and their sense of smell allows them to detect changes in
  - Floral scents,
  - Weather conditions, and
  - Potential hazards like pesticides
- When a bee encounters a flower with a rich source of nectar or pollen, it can quickly recognize and remember the scent profile of that flower



# LIFECYCLE NUTRITION

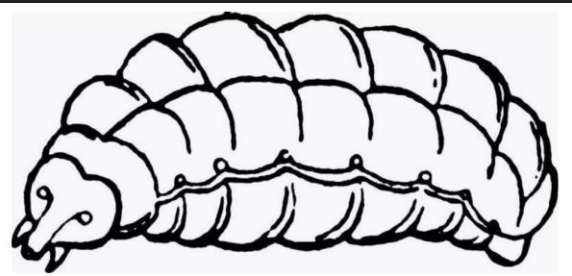
Royal Jelly

Bee Bread

Carbohydrates  
Protein

Nectar

Carbohydrates

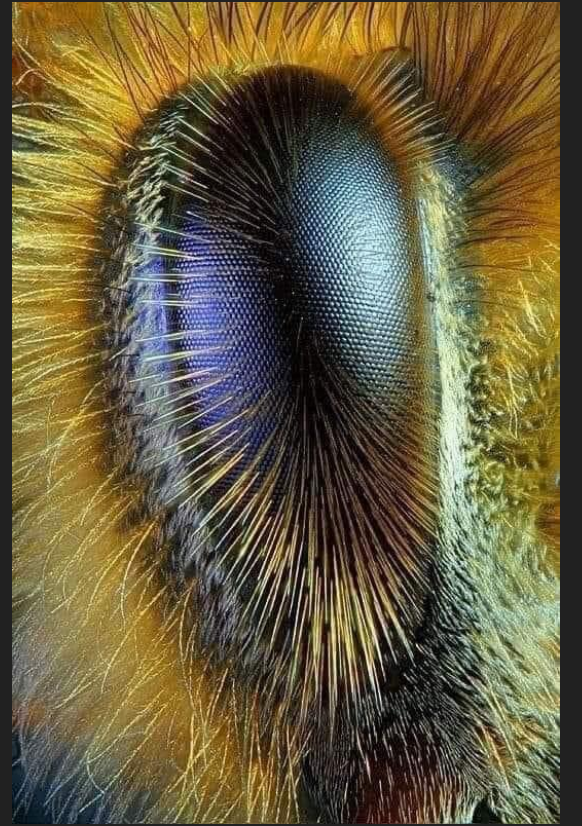


Honey Bee Larvae



Adult Honey Bee





# POLLEN COLLECTION



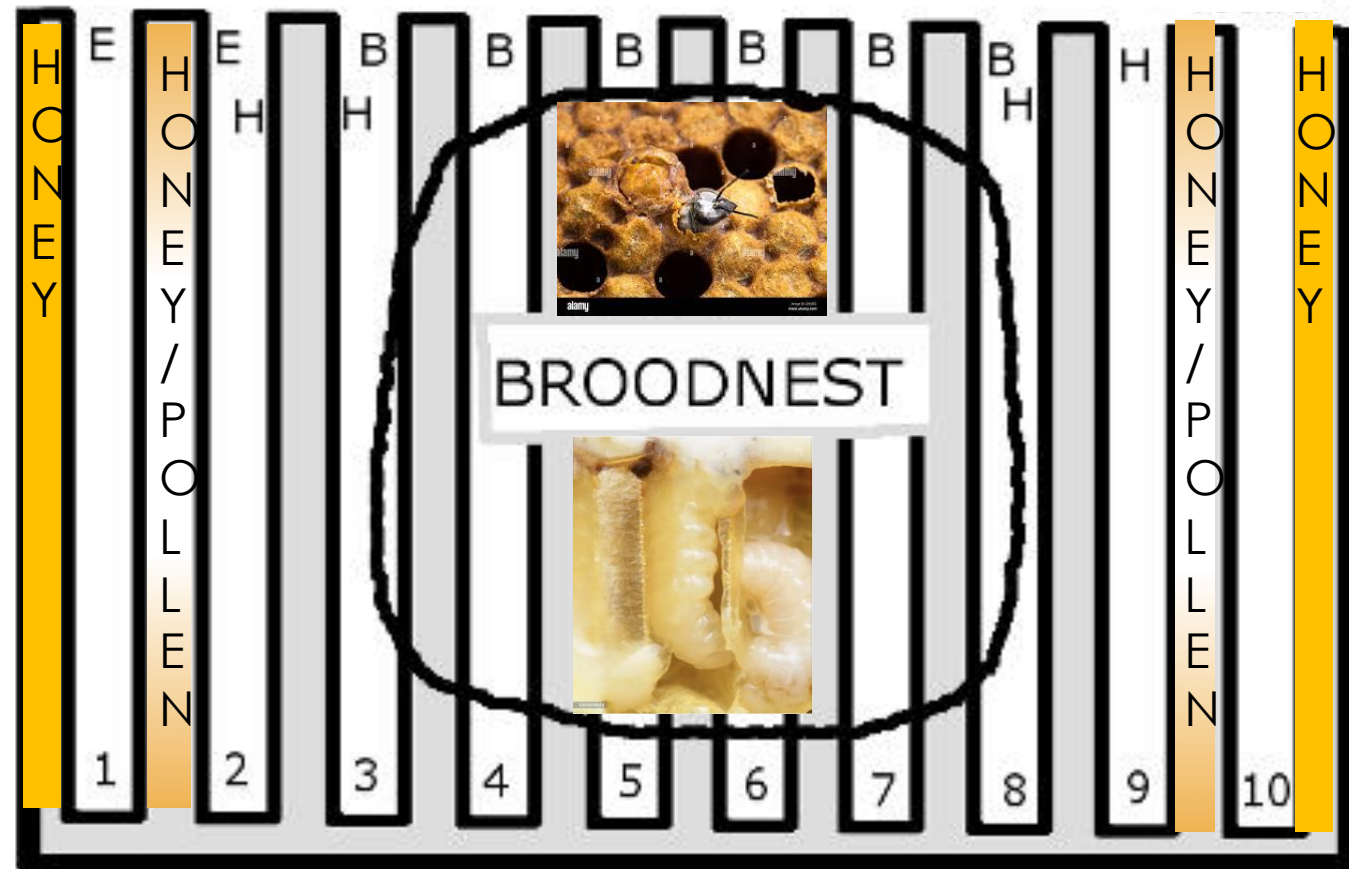


# BALANCED POLLEN PATTY

- Added nutrition
  - Carbohydrates,
  - Proteins,
  - Lipids,
  - Vitamins and
  - Minerals

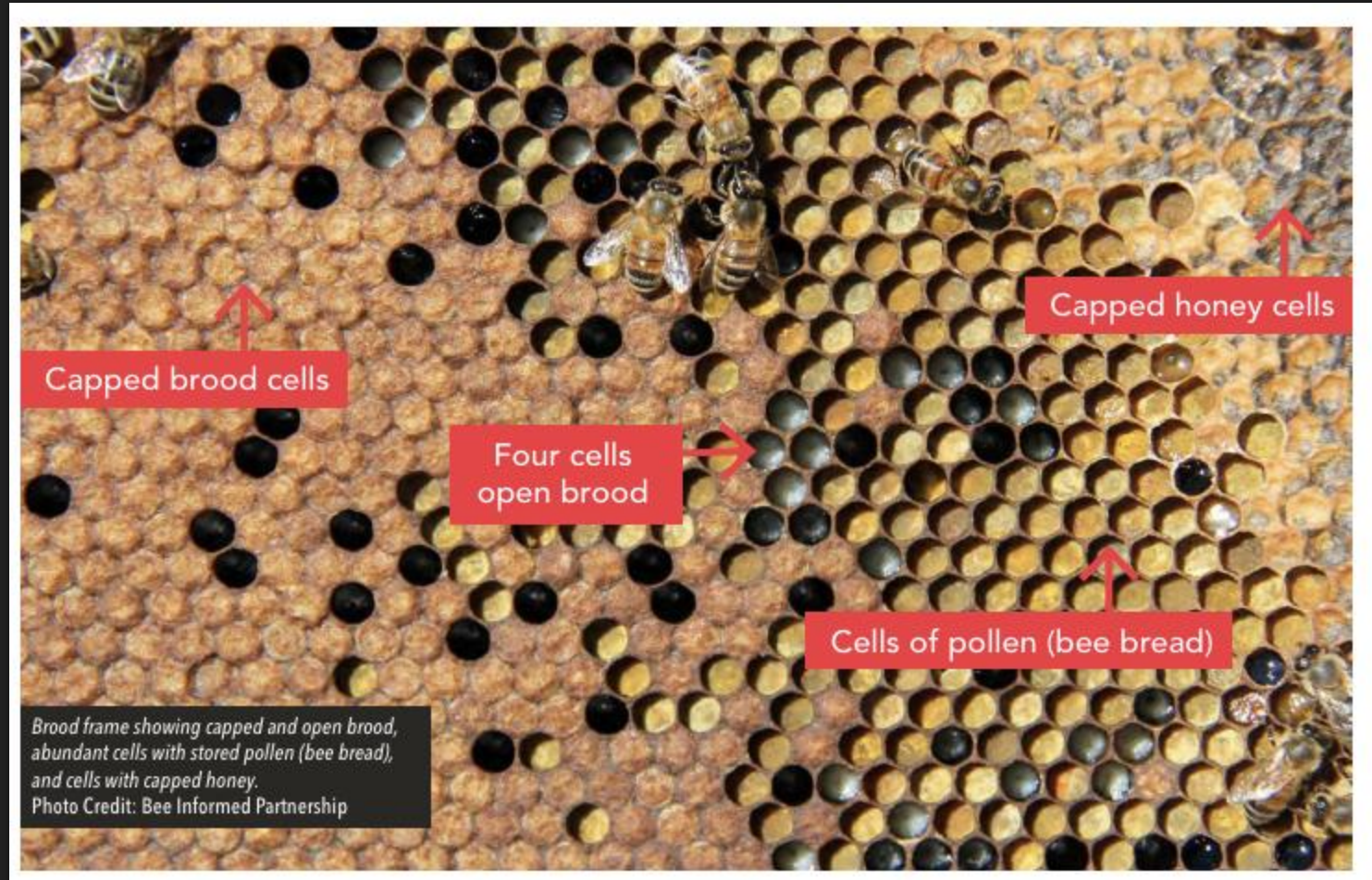


# BROOD BOX

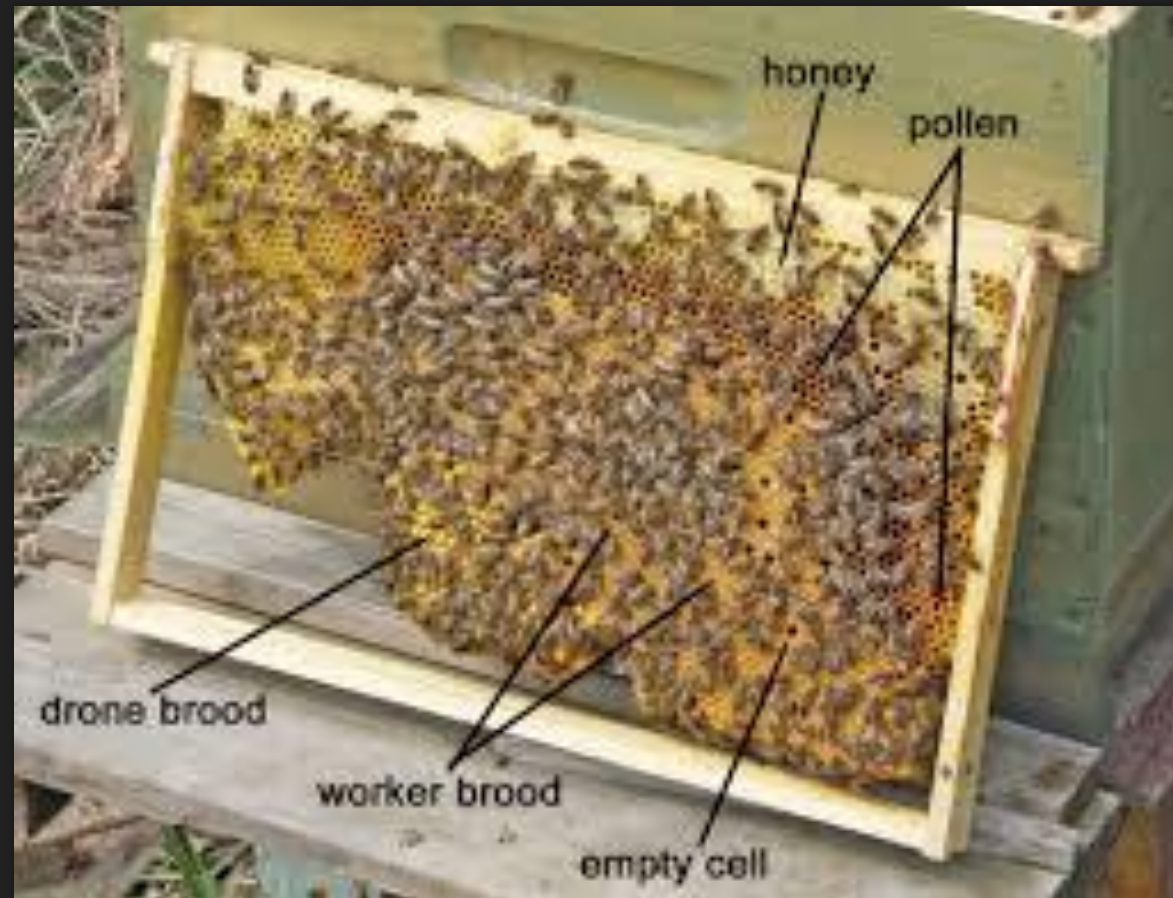




# HONEY BEE BROOD FRAME NUTRITION



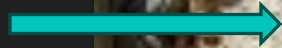
# BROOD FRAME





# BROOD FRAME

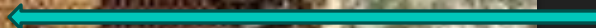
Honey



Pollen



Worker Brood



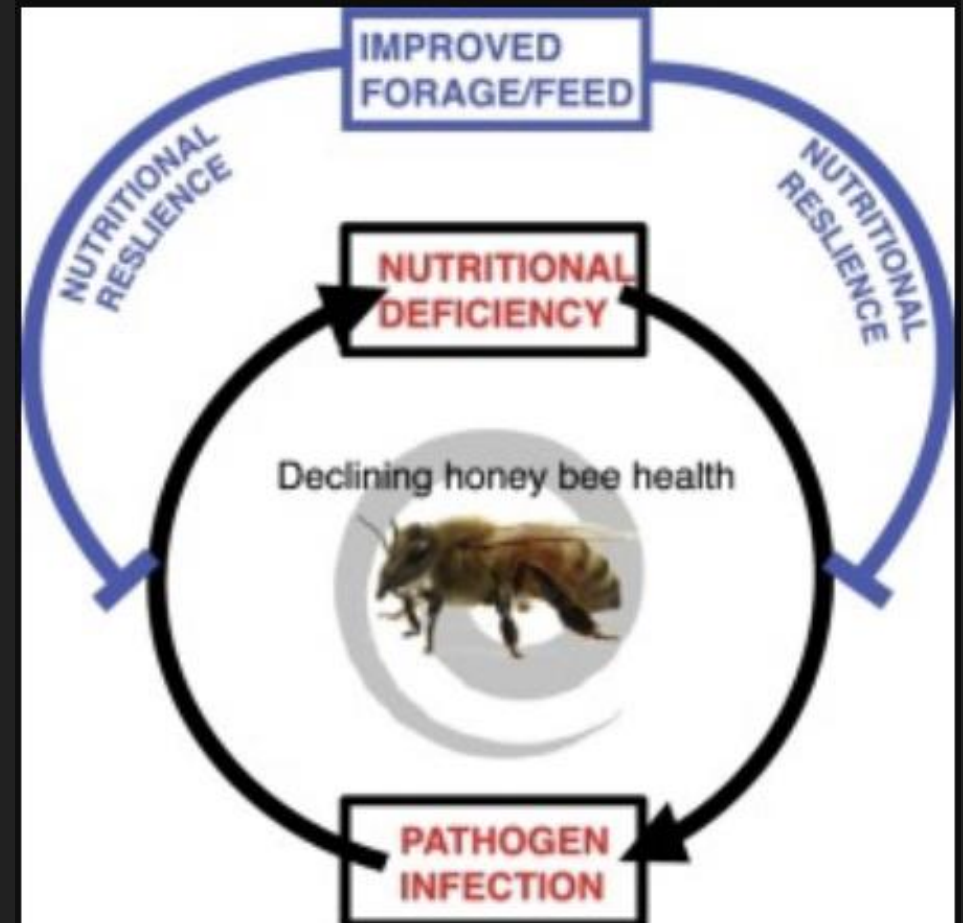
# LARVAE NUTRITION





# NUTRITION - DISEASE

- Infection affecting physiological nutrition via digestion and
- Effects on behavior that impact hive level nutrition



# LIMITATION OF ESSENTIAL NUTRIENTS

- Pollen, or
- Essential amino acids or
- Vitamins



➤ **WILL CEASE BROOD PRODUCTION**  
➤ **MAY NOT SURVIVE**

**IF NOT SUPPLIED WITH MISSING NUTRIENT**

# CANABALIZATION

- Honey Bee Brood Cannibalization
  - Regulate resources
  - Disease
  - Hygienic control mites

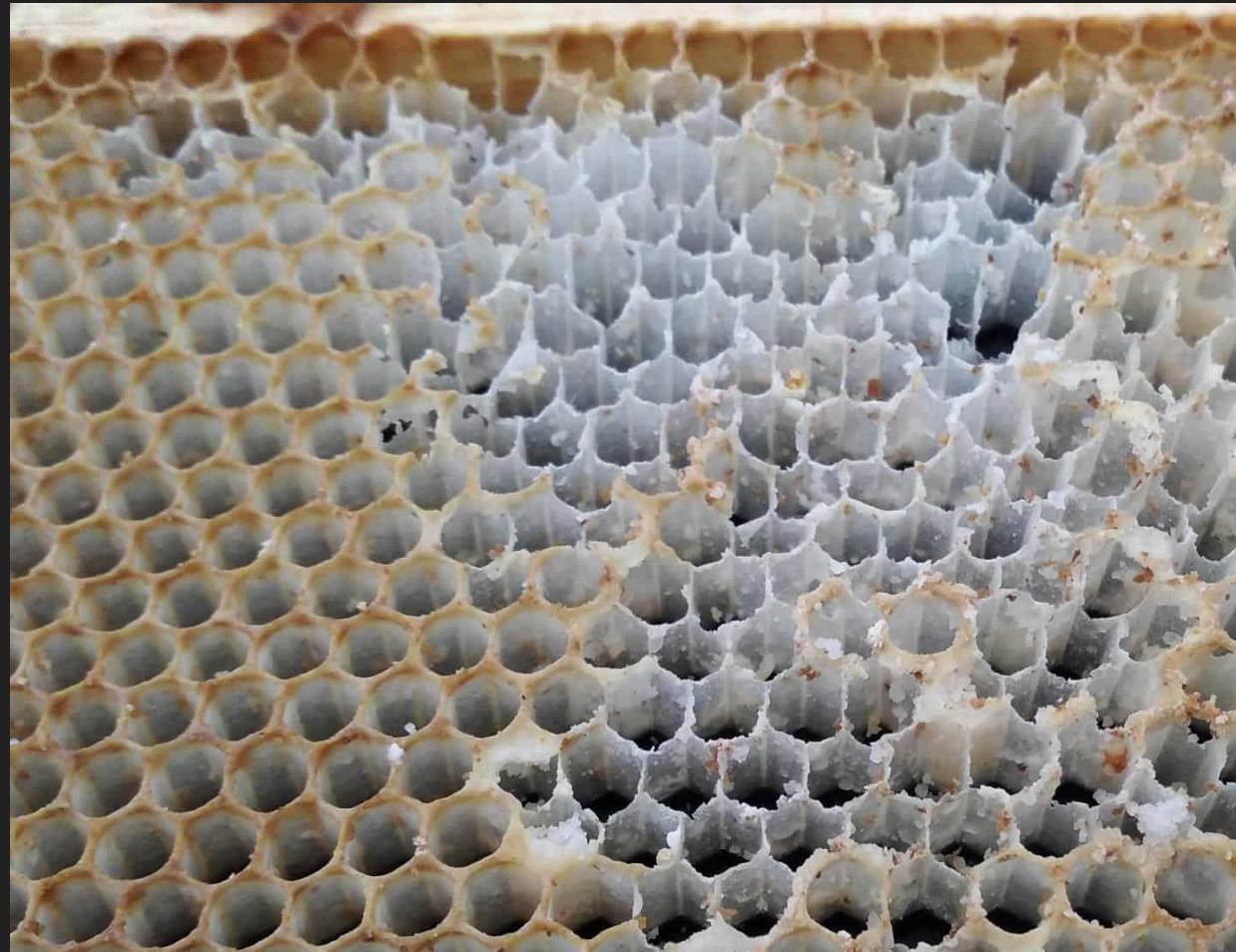


By Amanda Shaw, Waggle Works PDX



# ROBBING

○ Ravaged cells





# BEST MANAGEMENT PRACTICES HIVE HEALTH



<https://honeybeehealthcoalition.org/resources/hive-health-best-management-practices/>

# CONCLUSION

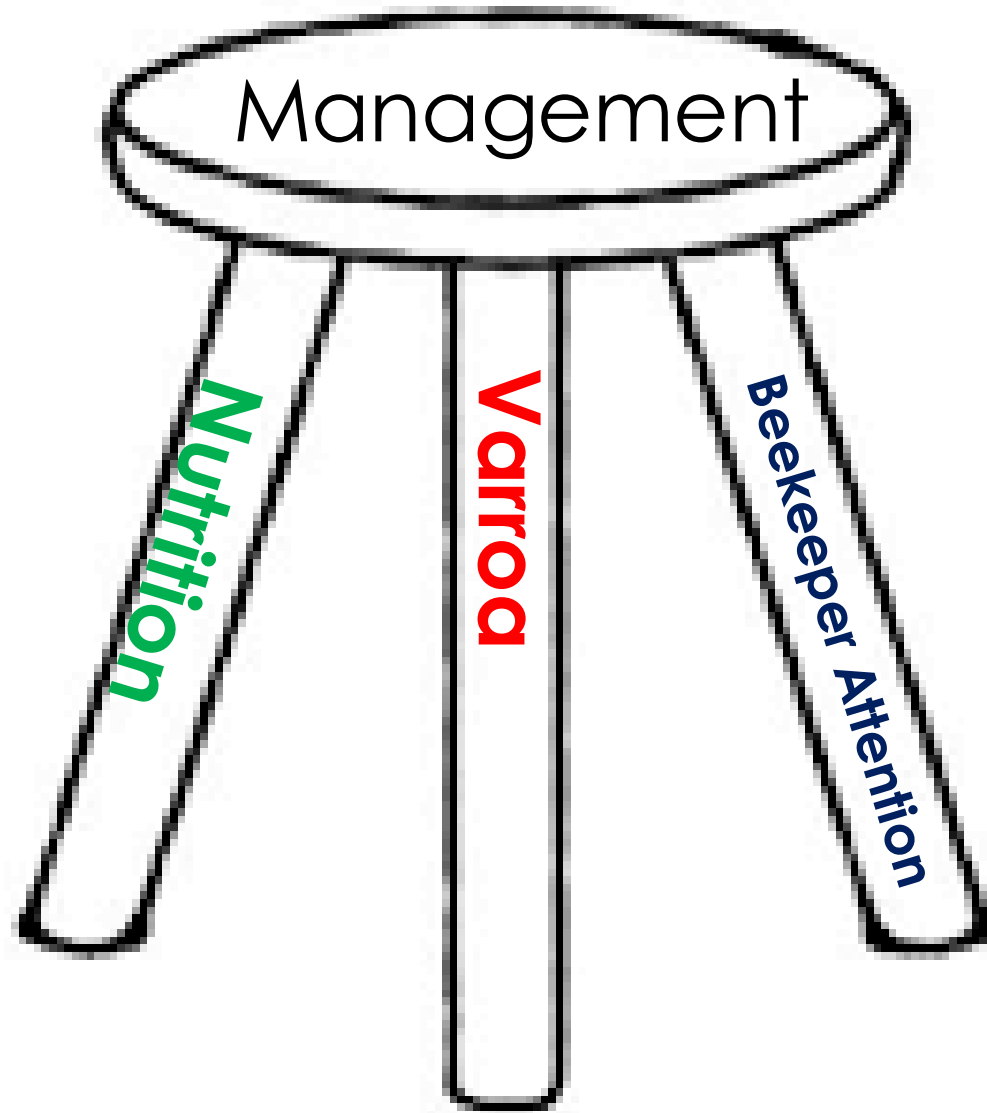
- A balanced diet
- Nutrition underlies disease control
- **IF IT AIN'T THERE – ADD IT**



# NUTRITION SUPPORT

- Fondant Patty
- Fresh Pollen
- Fondant (sugar)







# TRIFECTA

- JUNE 7 2025 (SATURDAY)
- HOOD RIVER OREGON

## •SPEAKERS

- Dr Dewey Caron
- Dr Becky Masterman
- Dr Chakrabarti Priyadarshini

# Questions

○ Charlie Vanden Heuvel

○ [Charlie.bgbees@gmail.com](mailto:Charlie.bgbees@gmail.com)

○ <https://bg-bees.com/>

BG BEES



THE KEEPING OF BEES IS LIKE THE DIRECTION OF SUNBEAMS

Henry David  
Thoreau