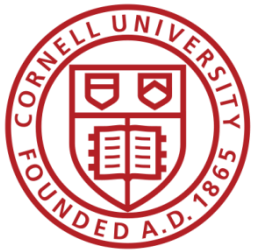
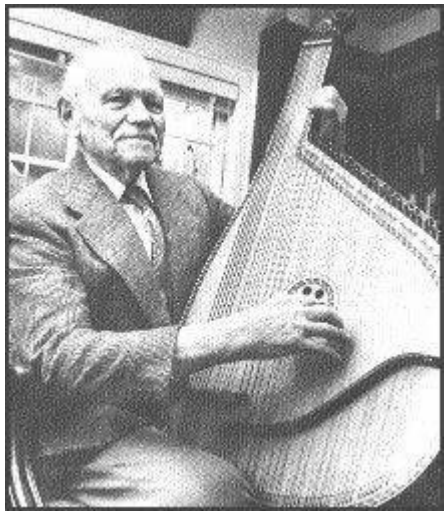


Cornell Cooperative Extension

Honey Bees & Beekeeping

Reflections on Thirty Years with Apis Mellifera

My beekeeping journey



Why do Honey Bees make honey?

Bees in Winter

Biology of the Honey Bee

- Apis Mellifera, the European Honey Bee has several constituent races, each with their own characteristics:
  - Italian
  - Carniolian
  - Caucasian
  - Russian
- Even within the races, honey bees tend to adapt to local conditions and pass those behaviors on to succeeding generations
- This localization has been both an important survival behavior and an impediment to beekeeping

Biology of the Honey Bee -- Who is in the Hive?

- Queen
  - 1 per colony, simply worker bees that were fed “Royal Jelly” and raised in a special cell
  - In nature lives 2-5 years
  - Lays all of the eggs for the colony. Predetermines the sex of the egg.
  - Queens mate once and at that time gather enough sperm from several drones that they carry through their reproductive life
  - Releases Pheromone called, “Queenright” that is vital to hive operations
  - As Queen loses ability to lay eggs, her “Queenright” weakens triggering the workers to raise her successors

Biology of the Honey Bee -- Who is in the Hive?

- Workers
  - Most honey bees in colony are workers, usually 10-50k per hive.
  - Workers bodies develop differently than queens. They have:
    - Wax glands
    - Specialized food gathering apparatus including longer tongues, pollen baskets on legs and a nectar crop
  - Workers roles in hive change through lifespan after emerging as adults:
    - Nurse bees
    - Guard bees
    - Foragers
    - Other tasks, comb building, undertaking, etc.
  - Lifespan of average bee is six weeks in the summer or six months in winter
  - Mortality rate for foraging bees in high summer is as high as 10% per hour of flight
  - Worker bees are both highly sensitive to pheromones and produce them through 15 different glands on their bodies

Biology of the Honey Bee -- Who is in the Hive?

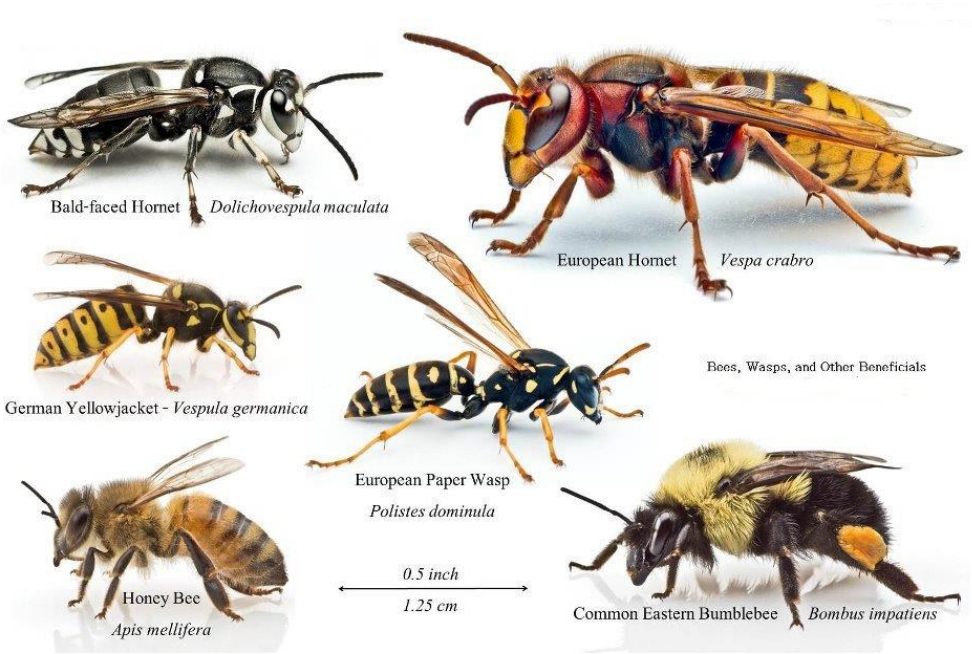
- Drones
  - Male bees with the specific role of fertilizing the queen
  - Have no body parts or behavioral inclinations to gather food, work on hive building or other day-to-day tasks
  - Body reflects their role with large eyes to see queen in flight during mating

Biology of the Honey Bee

- Drones at the end of the season

- https://www.youtube.com/watch?v=DkaEjP2Fi3k

Who are Honey Bees often confused with?



Where do these creatures live?

Paper nests built in trees or under the eaves of homes. Size varies.

Ground nests can be almost anywhere including in yards and next to homes.

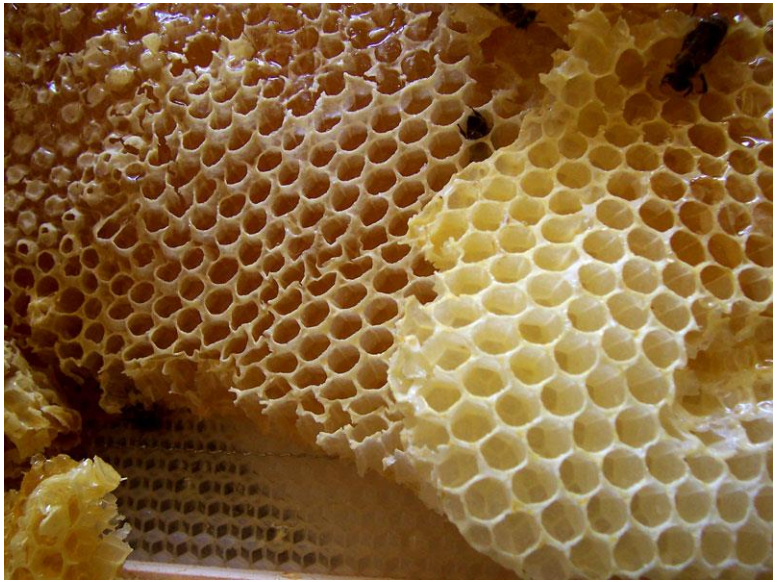
What do you do about Honey Bees in homes?

Honey Bee Architecture

Honey Bee architecture

- In nature, honey bees show distinct preferences for their homes:
  - In elevated location between 6 and 20 feet above ground
  - Build in cavities with volumes that range between 2 and 20 gallons
  - Downward facing entrances that face south (warmth and moisture regulation)
  - At least 1000 feet from parent colony
  - Sites that have evidence of previous honey bee occupation, wax and left over honey are preferred
  - Nesting sites tend to be in use for years (sometimes decades)
  - In the northeastern U.S. feral bees often choose trees and buildings

Honey Bee Architecture



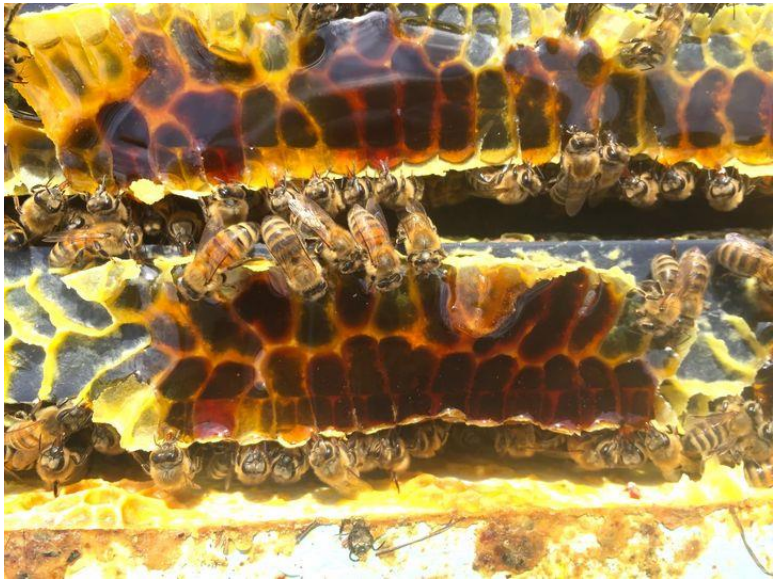
- Internal hive design:
  - Honey comb is built of wax exuded from worker bees glands
  - The cells within the comb are hexagonal and uniform in size
  - Honey comb is used to raise worker and drone brood (different size for each) process and store honey, pollen and “bee bread”
  - Interiors of hive naturally have 4-6 combs, human made 8-10 combs.
  - Comb use in the interior is organized from the inside (rearing young, winter cluster) to outer combs (food storage)
  - Comb cells are created with a slight upward angle to keep honey contained

Biology of the Honey Bee – What do Bees Do?

- Pollination and Honey Bees
  - Longer tongues reach further into flower for nectar
  - Pollen baskets and hairs both carry pollen back to the hive and serve to pollinate host flowers
  - Honey bees exhibit both species and area fidelity
  - Many agriculturally important plant species have coevolved with honey bees—Almonds, Blueberries and Apples

Honey Bees and Invasive Species

Honey Bees and Invasive Species



Honey Bees and Invasive Species

How much honey does one worker bee produce in her lifetime?

Biology of the Honey Bee – What do bees produce?

- Bees gather nectar to make honey
  - Foragers collect nectar in their crop, which when full is equal to 50% of their body weight. Foragers visit about 1,000 individual blossoms to fill their crop
  - Average lifetime production of honey per bee is 1/12 of a teaspoon
  - Nectar is between 70-80% water which needs to be reduced to less than 18% to be stable
  - Nectar is processed in the hive by workers passing it between themselves, fanning and adding enzymes and proteins
  - At the end of the process, honey is placed in the comb and then capped with wax for storage

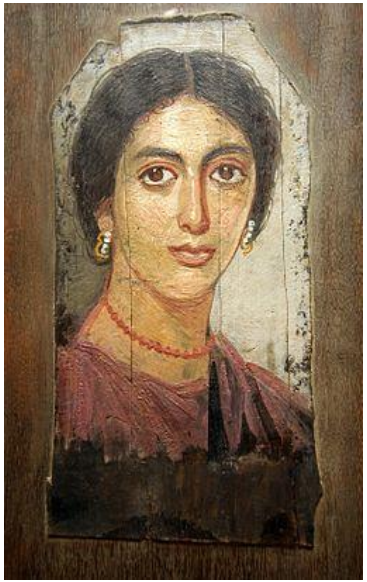
Biology of the Honey Bee – What do bees produce?

- The flavor of honey is largely dependent upon the nectar source.
- Varietal honeys include:
  - Orange Blossom
  - Basswood
  - Locust
  - Clover
- Because of our short growing season, the most common type of honey in the Northeast is “Wildflower” (Spring/Fall)

Biology of the Honey Bee – What do bees produce?

- Bees also gather pollen for use as a protein source
  - Pollen contains 35% protein, 10% sugars and other enzymes, minerals and vitamins
  - Bees mix it with honey to make “Bee Bread” and store it in the honeycomb
  - Color of pollen changes with different species of flowers

Biology of the Honey Bee – What do bees produce?



- Beeswax:
  - Produced from wax glands on the workers body it is used to build comb and create the structure of the hive
  - In ancient times, beeswax was one of the most valuable substances found in nature. It was used to:
    - Create high quality candles (often reserved for religious purposes)
    - Create artwork, particularly encaustic paintings (Fayum Mummy, AD 80-100)
    - Used as an international trading currency in the roman empire
    - Vital for mortuary practices in ancient Egypt
    - Creation of gold sculpture and jewelry through “Lost Wax” process

Biology of the Honey Bee – What do bees produce?

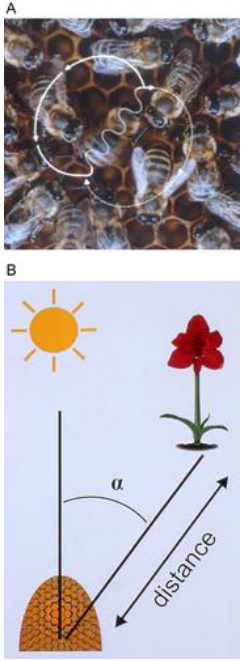
- Propolis:
  - “Bee Glue” a substance made from resinous plant materials, bee saliva and as yet unknown substances.
  - Propolis is an important component of hive construction, as a glue and insulating material
  - Propolis is used to fight pathogens in the hive by contact and by encapsulation
  - When mixed with natural varnishes it is used in fine woodworking, particularly musical instruments. (Stradivarius)

Honey Bee Communication

Three Modes, #1 Visual

- Every morning upon leaving the hive, honey bees circle it and imprint on its location from visual landmarks
- Honey bee vision has a greater sensitivity to light in the ultra violet range.
- Bees are very sensitive to changes in ambient light levels (time of day, time of year). Even within the dark hive

Honey Bee Communication



- Communication #2, Physical
  - The “waggle dance” is used by foragers to communicate new sources of nectar
  - The dance utilizes two fixed locations, the vertical plane of the comb and the angle of the sun to plot direction
  - The “waggle” is used to indicate the distance from the hive
  - Research suggests that there are “dialects” of the waggle dance specific to certain races of bees

Honey Bee Communication

Communication #3, Chemical

- Pheromones are the most powerful form of communication amongst honey bees
- There are over 50 different pheromones, each with a different meaning produced by bees in the hive
- Aside from the Queen, workers and drones produce their own pheromones

Honey Bee Communication

- Pheromones communicate a wide variety of critical messages:
  - Alarm
  - Group Identity
  - Need to Swarm
  - Management of Swarm
  - Brood Production
  - Controls the development of individual work roles and sexual development
  - Wax Production/Hive Building

Honey Bee Communication

- Pheromones Control Swarms
  - Why do bees swarm?
  - What causes swarming?
  - What happens to the bees that leave the hive and those that stay?

Honey Bee Communication During a Swarm

- https://www.youtube.com/watch?v=pnvZfsDXFnY

Honey Bee Communication--Mating

- Mating Queens leave the hive and seek out a Drone Congregation Area to find mates
  - Place about 50-120 feet in air, 300-600 feet in diameter
  - These places are consistent over time and attract drones from nearby hives
  - Queens are only attractive to drones within the DCA
  - Queens choose to fly to DCAs that are greater than 3 miles

What were the earliest animals domesticated by humans for agricultural use?

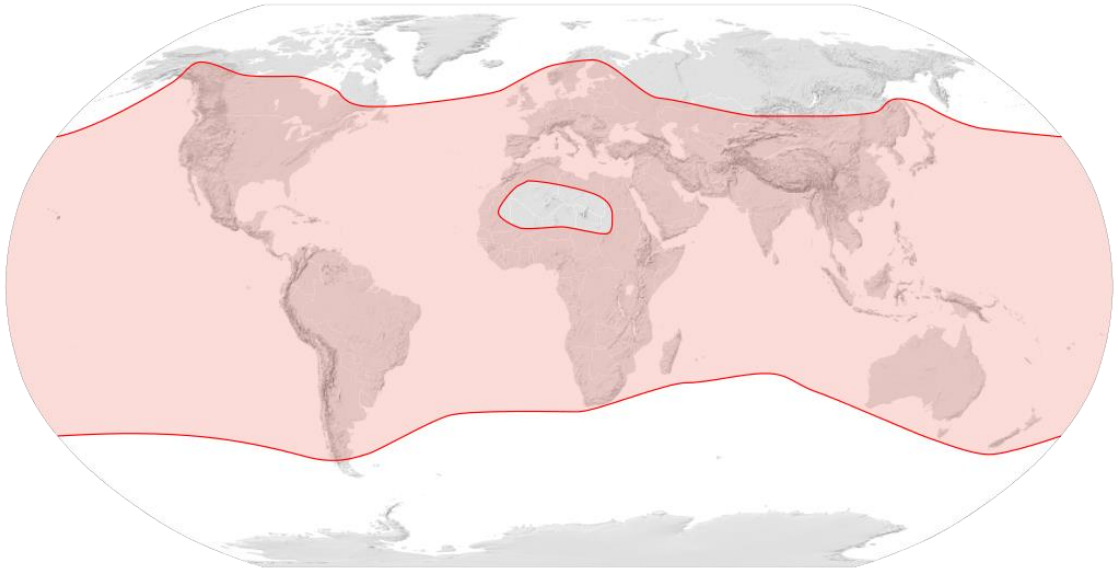
Humans and Honey Bees

- Honey bees have been valued by humans for at least 8,000 years
- From this scene a of honey hunter found in a cave in Valencia, Spain humans moved to:
  - Keeping bees in artificial hives designed to facilitate honey harvesting
  - Selecting varieties and species of bees for domestication
  - Moving bees in hives to follow the bloom in early Egypt

Humans and Honey Bees

Humans and Honey Bees

Humans and Honey Bees



So you want to keep bees?

- To think about before you commit:
  - Space
  - Time
  - Financial Commitment
  - Desired Outcomes
  - Philosophy
  - Bee Stings

What is your beekeeping philosophy?

Managing Honey Bee Health:

-Conventional

-Intensive Management

-Treatment-free

Beekeeping necessities

- What will it cost?
  - Tools and Supplies - $500 - $1000
    - 1-2 Hives and associated parts
    - Smokers, hive tools
    - Protective clothing
    - Books, etc.
- Why not buy used?

Space needs

Apiary Considerations

- Sunny location
- Natural windbreak to protect hive in winter
- Source of water available
- Away from potential pesticide use
- Convenient access for loading and unloading equipment
- Be a good neighbor
- Child proof, animal resistant
- Not visible from road

Beekeeping Safety

- Protective clothing:
  - Suit
  - Veil
  - Gloves
- Smoker
- Epi-pen
- Establish safety zone while working with bees

Where do I get Honey Bees?

Where do I get bees?

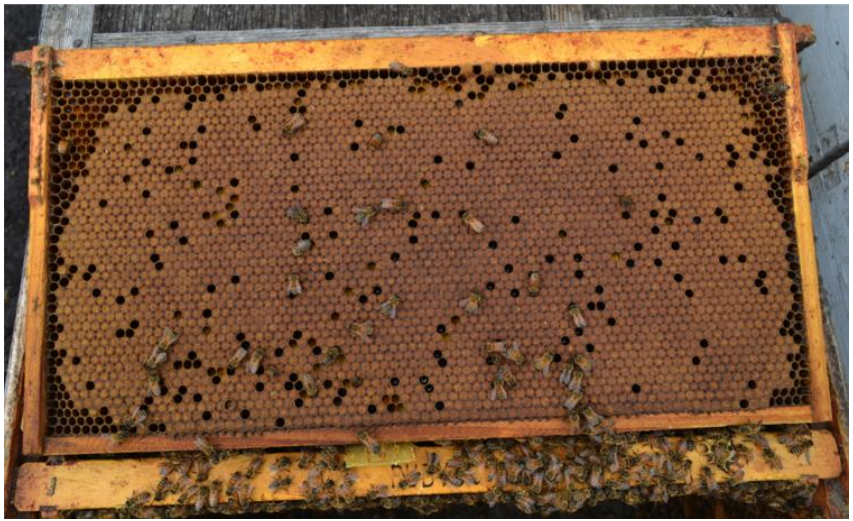
The Beekeeper's Year: Spring

- Check on over wintered colonies, install packages
- If necessary, feed prior to the Spring bloom
- Monitor hive health and the advancing bloom cycle
- If hives are "light", the bees need food and should be fed syrup and/or pollen patties
- Once the Spring bloom is in full swing (dandelion season), monitor hives for over crowding and "super up" as needed

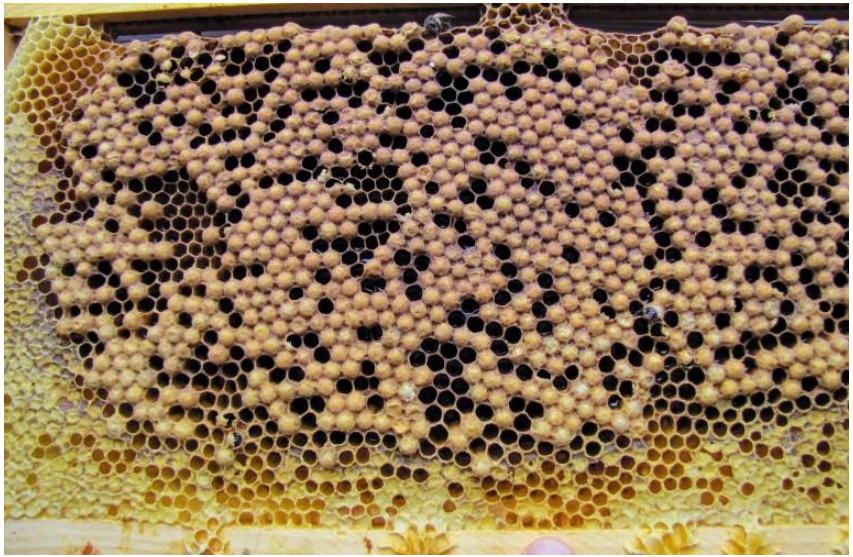
The Beekeeper's Year: Summer

- Monitor blooms coming in and out of season, keep a diary
- Check in on hives regularly:
  - Activity at entrance
  - Brood patterns
  - Supers being filled
- Bee aware of hive's disposition
  - Work on sunny days
  - Approach and work from back or sides of hive
  - Don't block hive entrances
  - Work quickly and calmly

The Beekeeper's Year: Summer



The Beekeeper's Year: Summer



The Beekeeper's Year: Summer, external pests

The Beekeeper's Year: Summer, internal pests

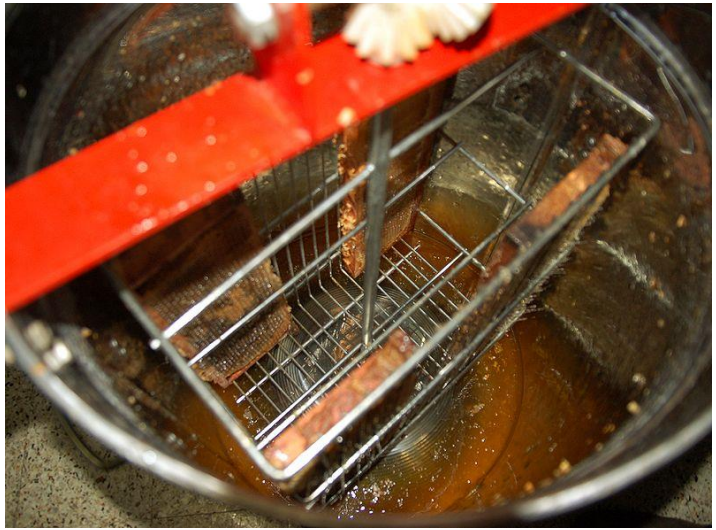
- Varroa
- Nosema
- American & European Foulbrood
- Hive Beetles
- Many others…

Beekeeper's Year: Preparing for the harvest

- Harvesting the honey:
  - Can you leave enough honey to get the bees through the winter? (70-90lbs)
  - Are the bees contained within the brood boxes?
  - Separating the bees from the supers
  - Storing the supers prior to extracting

The Beekeeper's Year: Harvesting honey

- Extracting:
  - Do you have the equipment or can you find someone to extract?
  - Alternative means of extraction
  - Bottling, packaging and clean-up
  - Labels and marketing your honey



The Beekeeper's Year: Winter

- Winter needs:
  - Shelter from prevailing winds
  - Ventilation
  - Protection from drifting snow
  - Access for beekeeper to shovel out hives that are over entrances

The Beekeeper's Year: Winter

- Check on bees during thaw periods.
- What to look for outside:
  - Flight activity
  - Yellow Snow
  - Dead bees
- What to look for inside:
  - Winter cluster placement
  - Status of honey stores
- Critical time is March and April

What are the products of the hive that you can use or sell?

What are the top three most adulterated food products in supermarkets?

What are the top three most adulterated food products in supermarkets?

What honey do you find in the supermarket?

Why is honey adulterated?

Honey flavored syrup, .50 - $1 +/- per pound retail

Supermarket honey, $7.19 per pound retail

Why is honey adulterated?

Local Honey from Beekeepers, $8.40 - $12 per pound

Specialty Honey, Ithaca Locust Blossom, $14 per pound

What about Organic and Raw Honey?

Organic honey needs to meet all organic farming criteria, typically only manageable in very isolated place like the Brazilian Rain Forest or Hawaii

Raw honey is minimally processed and filtered to retain natural elements like pollen and bee enzymes. Will crystalize.

Other Hive Products

- Pollen
- Pollination
- Beeswax
- Propolis

Keeping Bees for Health

- Honey for health
  - Seasonal Allergies
  - Topical Antiseptic
  - Culinary Substitute for Sugar
- Folkloric Medicine
  - Honey-gar Tonic
  - Propolis tinctures
  - Apitherapy

Supporting Honey Bees (and other pollinators)

- Keeping other pollinators

How do I learn more?

- County Beekeeping Clubs
- University Resources:
  - Print
  - Youtube Channels
  - Live Webinars
- Find a Mentor/Buddy

Mid-York Beekeeper Assoc.

https://midyorkbeekeepers.weebly.com/

Delaware County Beekeepers

https://www.facebook.com/Delaware-County-Beekeepers-Association-1402987823305670/

Leatherstocking Beekeepers Assoc.

https://leatherstockingbeekeepers.com/

Empire State Honey Producers Assoc.

https://eshpa.org/

How do I learn more?

- University Websites and YouTube Channels

- Dyce Lab for Honey bee studies

https://pollinator.cals.cornell.edu/resources/

- University of Minnesota Bee Lab

https://www.youtube.com/channel/UCVfueaRfmJHXh909GXT4dLg/videos

- University of Guelph Honey Bee Research Center

https://www.youtube.com/c/UoGHoneyBeeResearchCentre/featured

Other Information Sources

- Bee Culture Magazine:
  https://www.beeculture.com/
- Beekeeping Today Podcast:
  https://www.beekeepingtodaypodcast.com/
- PolliNation Podcast:
  https://blogs.oregonstate.edu/pollinationpodcast/
- Honey Bee Obscura Podcast:
  https://www.honeybeeobscura.com/
- Treatment Free Beekeeping Podcast:
  https://tfb.podbean.com/

The future of beekeeping