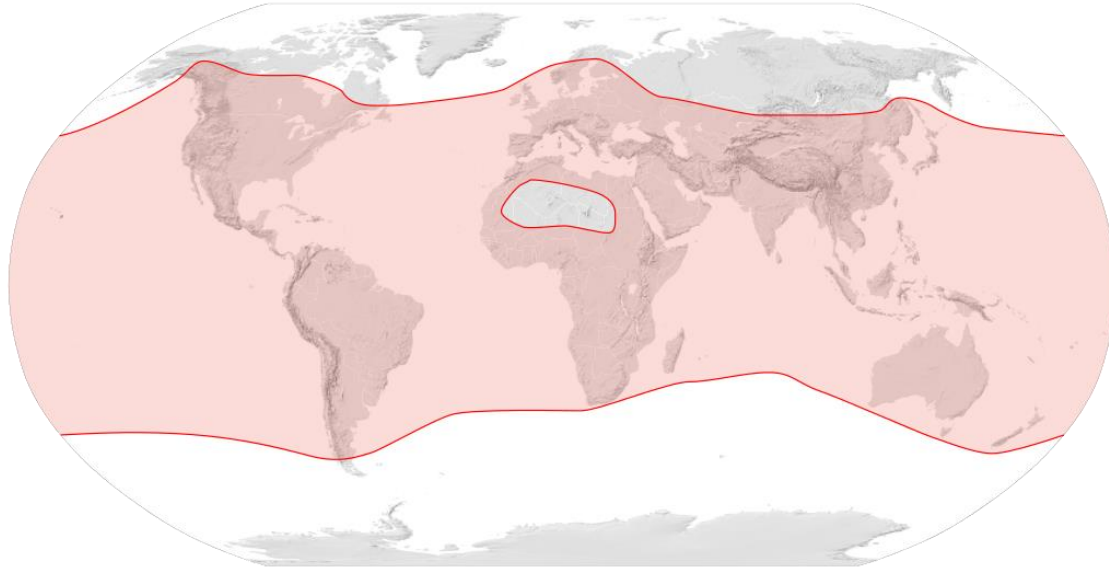


# Cornell Cooperative Extension

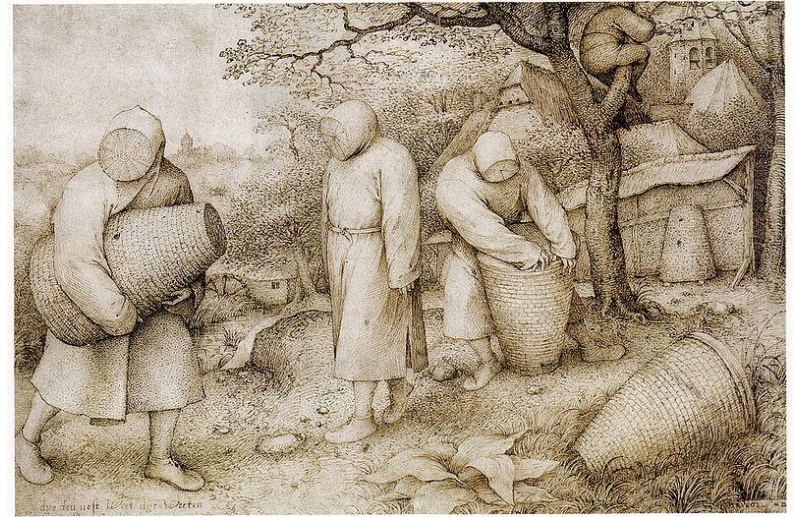
# Honey Bees and Beekeeping

*An Introductory Look at an Age Old Practice*

# Humans and Honey Bees



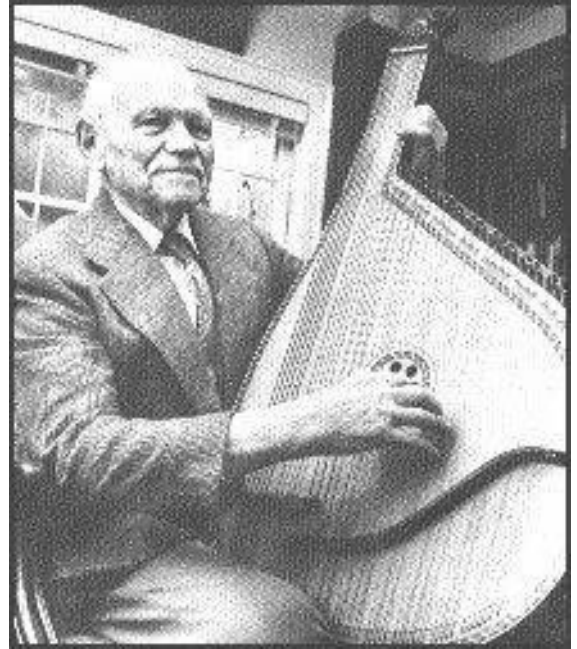
# Humans and Honey Bees



# Humans and Honey Bees



# 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 longertongues, 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, **protection** or other day-to-day tasks
  - Body reflects their role with large eyes to see queen in flight during mating



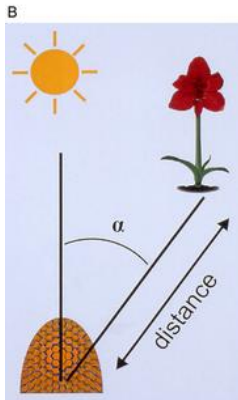
# Honey Bee Communication

## 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

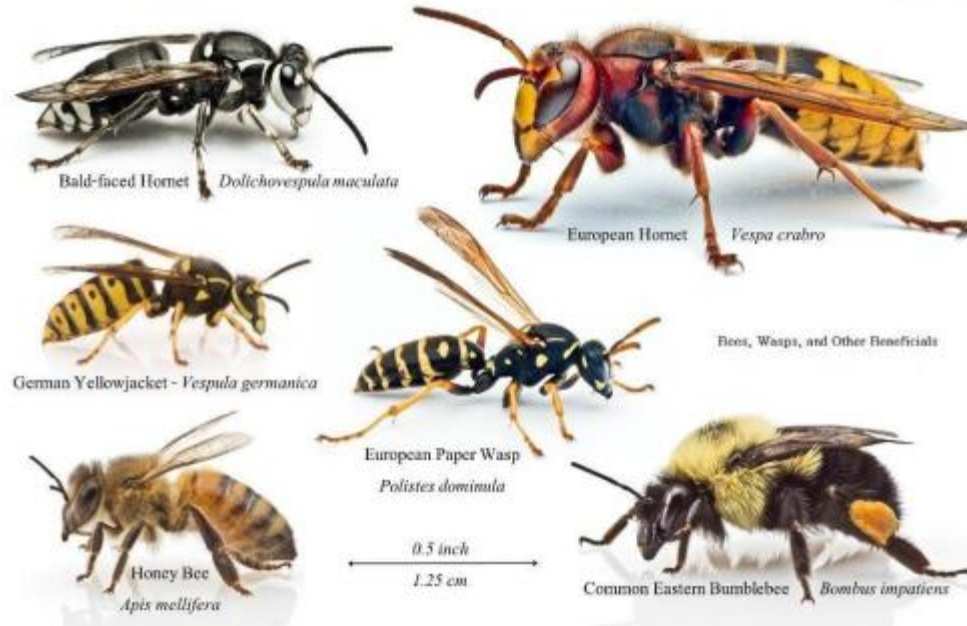
<https://www.youtube.com/watch?v=w3B5Umpxl2s&t=283s>

# 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

# Who are Honey Bees often confused with?



# Honey Bee Architecture



# Honey Bee architecture

- In nature, honey bees show distinct preferences for their homes:
  - In an elevated location between 6 and 20 feet above ground
  - Built 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

# Honey Bee Architecture – Human Influences



- Apiaries vary significantly from the natural preferences of honey bees:
  - Grouped closer together
  - Low to the ground
  - Pollinators follow the bloom
  - Langstroth hives both take advantage of and distort “bee space”



# Biology of the Honey Bee – Pollination

- 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



# 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

# Honey as a Consumer Product



# What is Honey?



- 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/Summer/Fall)

# Market Conditions: It was the best of times, it was the worst of times

Figure 33  
US honey price, 1986-2020

Cents per pound

250

200

150

100

50

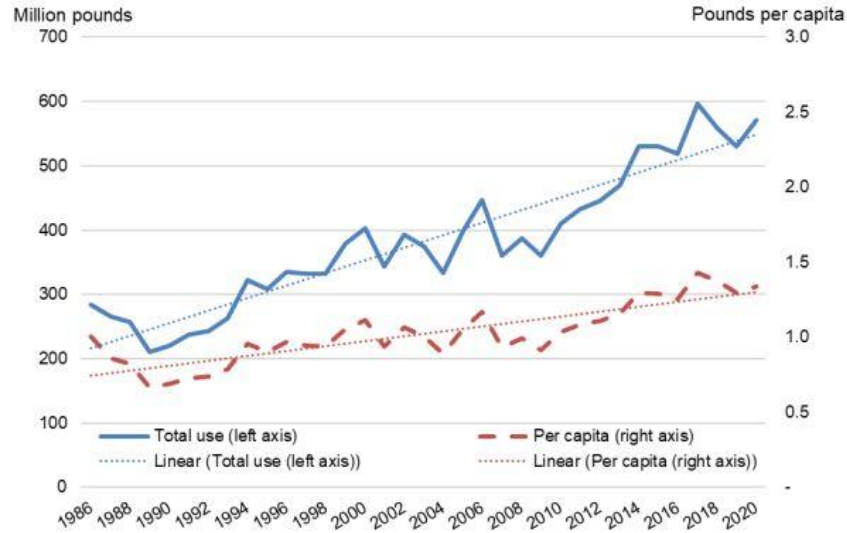
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1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020

Source: USDA, National Agricultural Statistics Service.

# Market Conditions: It was the best of times, it was the worst of times

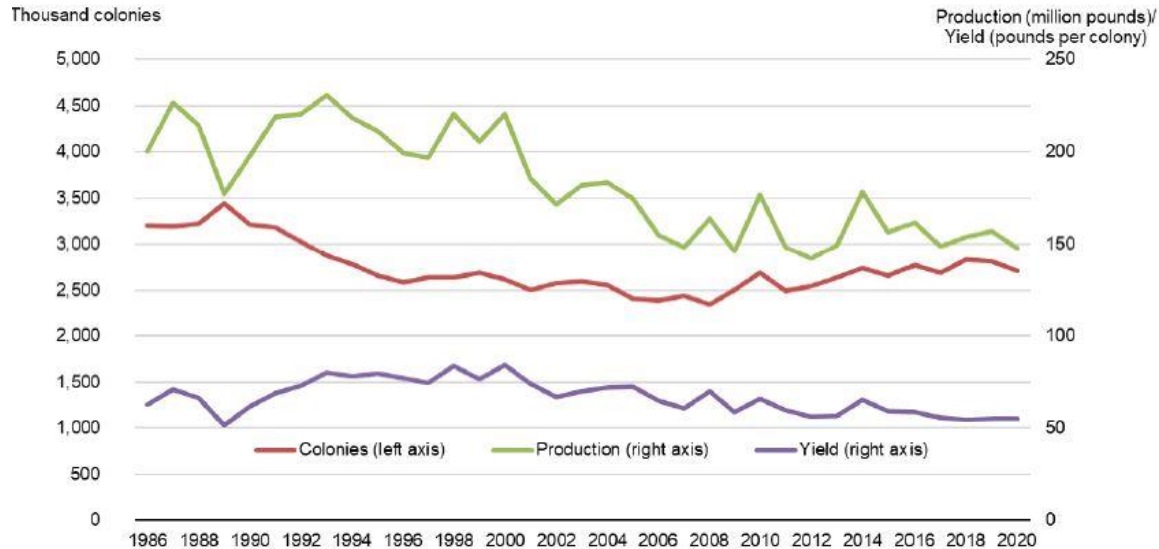
Figure 30  
US honey consumption 1986-2020



Source: USDA, National Agricultural Statistics Service.

# Market Conditions: It was the best of times, it was the worst of times...

Figure 31  
U.S. honey production, number of colonies, and yield, 1986-2020



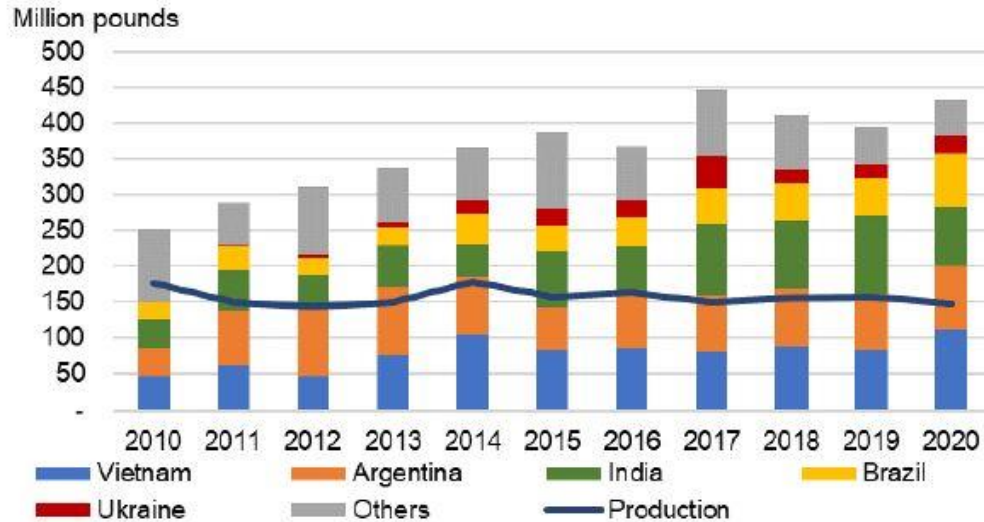
Source: USDA, National Agricultural Statistics Service.



# Market Conditions: It was the best of times, it was the worst of times...

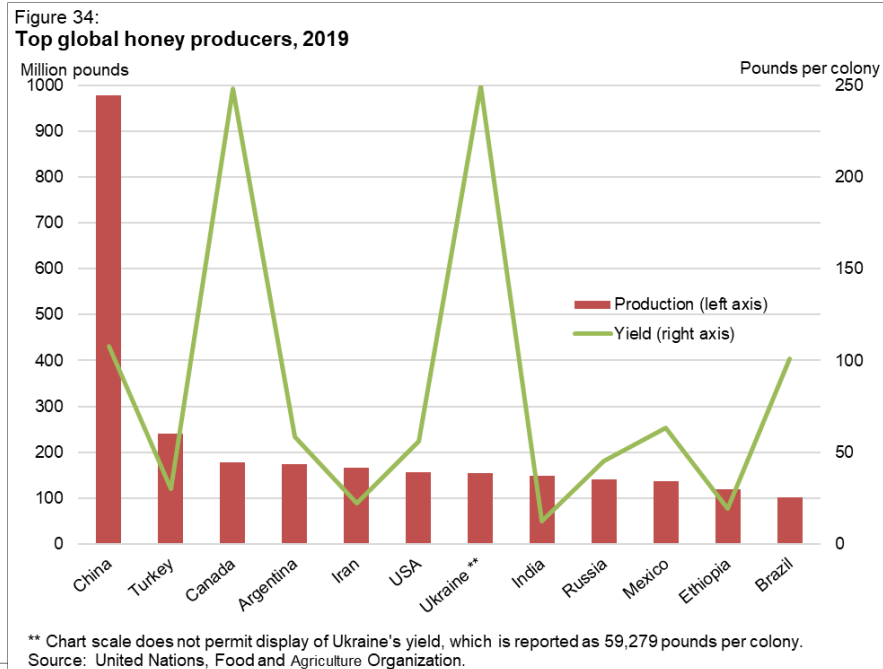
Figure 32

U.S. honey imports, by country, and U.S. honey production



Sources: USDA, National Agricultural Statistics Service and U.S. Department of Commerce, Bureau of the Census.

# Market Conditions: It was the best of times, it was the worst of times...



# How is this possible?



# What are the problems with imported honey?

Home > All Industries > Food & Beverage > Honey & Honey Products > Honey [Subscribe to Trade Alert](#)



[View larger image](#)



## PREMIUM CITRUS HONEY

FOB Reference Price: [Get Latest Price](#)

**\$2.00 - \$4.00** / Kilogram | 1000 Kilogram/Kilograms(Min. Order)

Lead Time:

Quantity(Kilograms)	1 - 1000	1001 - 5000	>5000
Est. Time(days)	7	15	To be negotiated

Shipping: Support Sea freight

[Alibaba.com Freight](#) | [Compare Rates](#) | [Learn more](#)

# What are the problems with imported honey?

HOME > NEWS

## Honey is one of the most faked foods in the world, and the US government isn't doing much to fix it

Cody Copeland Sep 26, 2020, 9:47 AM



amazon.com/dp/B01DTAIXAG?axitk=816c2f063abb0b88d15985a344fd0f...

m mac of all trades

Certified

# What are the problems with imported honey?

SCIENCE \ ENVIRONMENT \ FOOD \

## Bad news for bees: three-quarters of all honey on Earth has pesticides in it

*'There's almost no safe place for a bee to exist.'*

By [Alessandra Potenza](#) | [@ale\\_potenza](#) | Oct 5, 2017, 2:00pm EDT

[f](#) [🐦](#) [📄](#) SHARE



/B01DTAIXAG?aaixitk=079af583cd5f414729cf450293b4bb...



# What can you do to support honey bees?



# Local Honey Production in Upstate NY

- Seasonal honeys
  - Spring (May – June)
  - Summer (July – August)
  - Autumn (September – October)
- Varietal honeys
  - Basswood
  - Locust
  - Buckwheat
  - Japanese Knotweed
  - Purple Loosestrife
- Local honey retail prices
  - \$8 -- \$14 per pound





# Local Honey Production in Upstate NY

## Forms of Honey:

- Comb Honey
- Raw Honey
- Strained Honey
- Crystallized Honey
- Creamed Honey
- Ultrafiltered/Heated Honey



# 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

# Other Hive Products: Pollen



- Bee Pollen is easily collected (with a pollen trap) and is used for:
  - Dietary Supplement
  - Topping for dessert products
  - Ingredient in health shakes and smoothies
- Pollen is believed to help with plant allergies and to contain vitamins, enzymes and other healthful components.

# 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
  - Used for:
    - Candles
    - Ingredient in fine varnishes, like violin making
    - Sculpture
    - Jewelry Making
  - Some churches require beeswax candles for use in sanctified spaces

# Biology of the Honey Bee – What do bees produce?



- Beeswax in Ancient times
  - Most valuable hive product in early times
  - It was used to:
    - Create high quality candles
    - 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

# Other Hive Products: Propolis



- Propolis, or “bee glue” is used for woodworking, medicinal compounds and cosmetics.
- Made by the bees from plant resins and saps the product is highly variable from season to season, hive to hive and sometimes even within a single hive.
- Price and markets for propolis are all over the map. The most consistent way to sell is creating a propolis tincture for health purposes.

# Keeping Bees for Health

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



# What do you do about Honey Bees in homes?





# 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 to begin?
  - Tools and Supplies - \$600 - \$1200
    - 1-3 Hives with bees 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

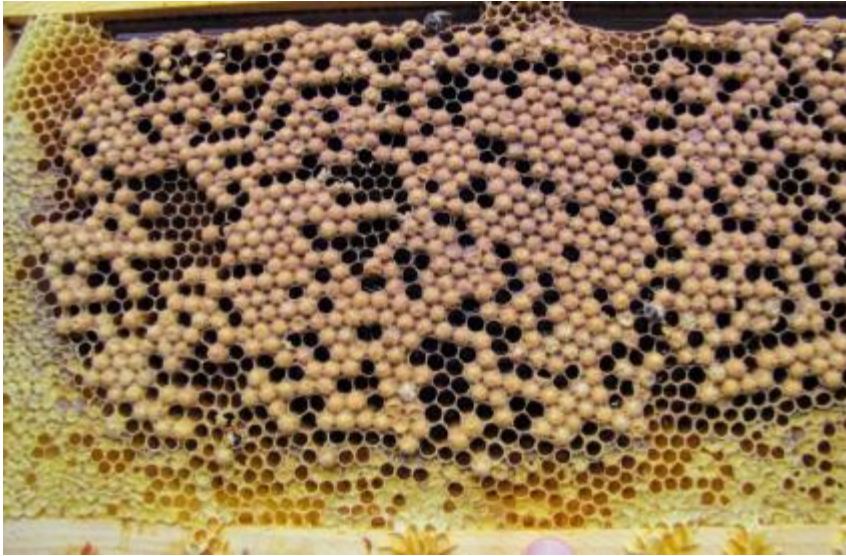
- Monitor blooms coming in and out of season, keep a diary
- Check in on hives regularly:
  - Activity at entrance
  - Brood patterns
  - Supers being filled
- Bee aware of hive's disposition
  - Work on sunny days
  - Approach and work from back or sides of hive
  - Don't block hive entrances
  - Work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

- Winter needs:
  - Shelter from prevailing winds
  - Ventilation
  - Protection from drifting snow
  - Access for beekeeper to shovel out snow that is 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

# How do I learn more?

- County Beekeeping Clubs
- Beekeeping Catalogs
- 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 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>

# How do I learn more?

- Podcasts:
  - Beekeeping Today:  
<https://www.beekeepingtodaypodcast.com/>
  - Two Bees in a Podcast:  
<https://entnemdept.ufl.edu/honey-bee/podcast/>
  - Honeybee Obscura:  
<https://www.honeybeeobscura.com/>
- Bee Culture Magazine:  
<https://www.beeculture.com/>
- American Bee Journal:  
<https://americanbeejournal.com/>

# Where can I buy beekeeping supplies locally?

## Local Suppliers:

- Johnstons Honey Bee Farm:  
<http://www.johnstonshoneybeefarm.com/>
- Kutik's Honey:  
<https://www.kutiks.com/>
- Ford Honey Farms:  
<https://www.fordshoneyfarm.com/>

## National Companies:

- Betterbee:  
<https://www.betterbee.com/>
- Dadant Beekeeping:  
<https://www.dadant.com/catalog/>
- Mann Lake:  
<https://www.mannlakeltd.com/>

