

# Santa Cruz Beekeepers Guild

## Advanced Beekeeping

May 1<sup>st</sup>, 2013



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# Contents

## ADVANCED BEEKEEPING CLASS

- 1 ✓ ● European Honey Bee Biology
- Types of Flowers Used
- 5 ✓ ● Equipment Use Review
- 2 ✓ ● Workings of the Hive
- 3 ✓ ● Swarm prevention
- Splits
- 4 ✓ ● Varroa Mite, Tracheal Mite & Nosema
- Seasonal Management
- Pulling the Surplus Honey
- The Extraction Process
- Honey Marketing

# What is Advanced Beekeeping ?

- When you feel confident in your ability to maintain a beehive throughout the year and have been successful in producing surplus honey, you are ready to undertake more complex and difficult projects with your bees.

# 1) European Bee Biology- Races

- Italian Honey Bee (*Apis mellifera linguistica*)
  - Yellow with dark brown bands
  - + Excellent foragers, calm, moderate swarming
  - - More susceptible to diseases
  
- Carnolian Honey Bee ( *Apis mellifera carnica*)
  - Grayish black-brown body
  - + Rapid built-up in spring (good pollinator), very gentle
  - - Swarms when out of room, brood needs lots of pollen



# Bee Races Summary

	<i>Italian</i>	<i>German</i>	<i>Carniolan</i>	<i>Buckfast</i>	<i>Caucasian</i>	<i>Russian</i>
<b>Color</b>	Light	Dark	Black	Medium	Dark	Gray
<b>Disease resistance</b>						
<b>Varroa</b>	-	-	-	-	-	+
<b>Tracheal</b>	-	-	-	+	0	+
<b>AFB*</b>	0	-	+	0	0	0
<b>EFB**</b>	0	0	0	0	0	0
<b>Other</b>	0	0	+	+	-	0
<b>Gentleness</b>	Moderate	Low	High	Low-Mod	High	Low-Mod
<b>Spring buildup</b>	Good	Low	Very Good	Low	Very Low	OK
<b>Over-wintering ability</b>	Good	Very Good	Good	Good	OK	Very Good
<b>Excess swarming</b>	OK	OK	High	Low	Low	OK
<b>Honey processing</b>	Very Good	OK	Good	Good	Low	OK
<b>Propolis</b>	Low	OK	Low	Low	High	OK
<b>Other traits</b>	Heavy robbing	Short tongue, nice white cappings	Low robbing, good comb builders	Supersedure queens produce defensive colonies	Long tongue	Brood rearing affected by flow, queen cells always present

\* AFB = American foulbrood

\*\* EFB = European foulbrood

# Bee Castes

Worker – 10,000 to 50,000

Sterile female who does various tasks, such as searching for food, building cells and defending the colony.



Queen – 1 per hive

The only reproductive female in the colony, whose sole function is to lay eggs; it is fertilized by five to 10 drones.

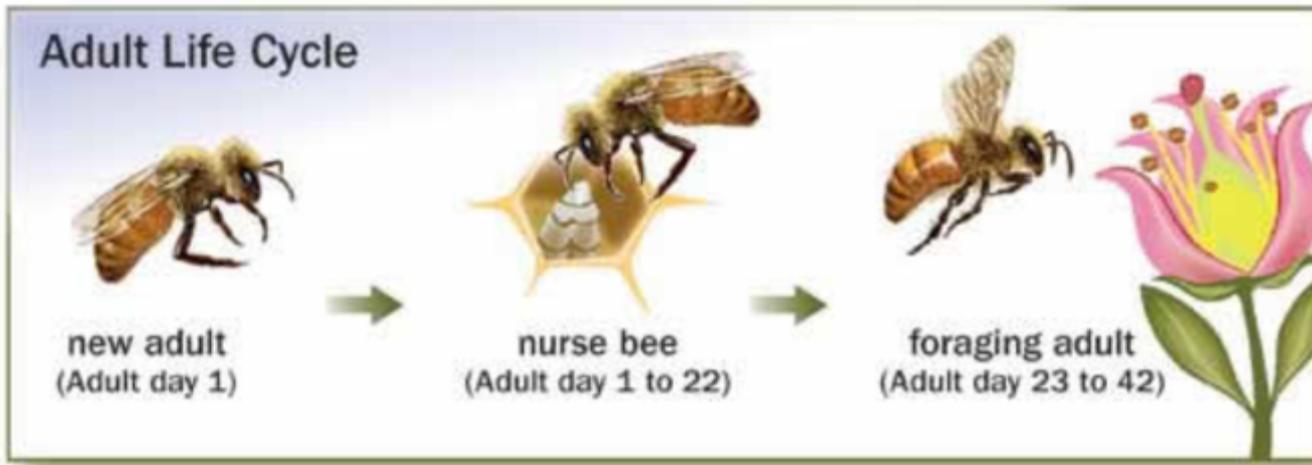


Drone – 100 to 500, seasonal

Stingless male bee; its only function is to reproduce.



## 2) Worker Bee Cycle



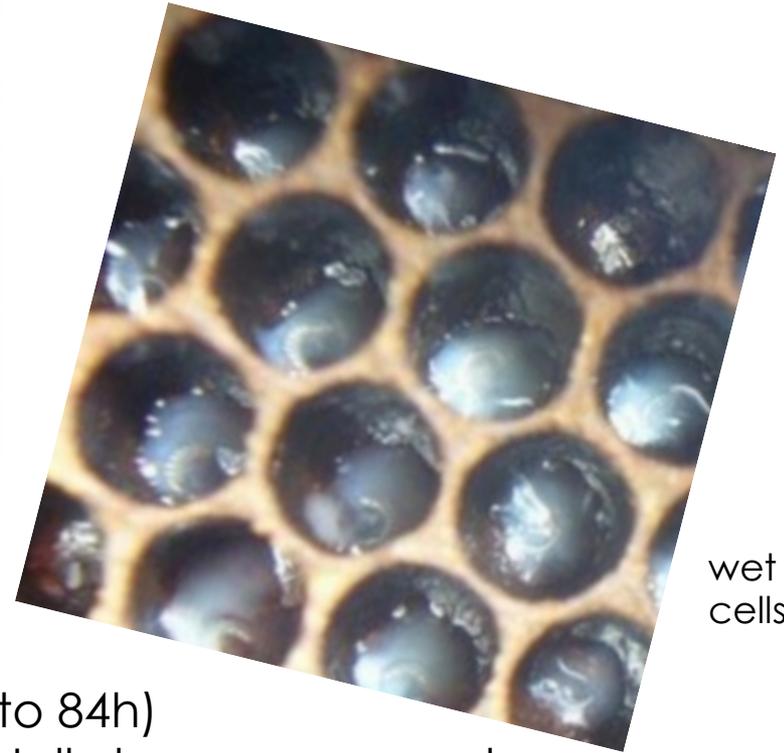
Clean d1-2 → Nurse d3-11 → Cap cells d12-17 → Guard d18-21 → Forager d22 – 9w

# Egg Stage (Day 1-3)

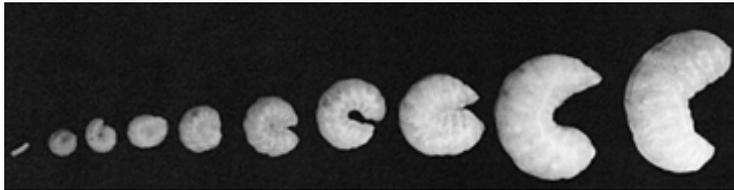


- \* Worker bees direct queen to either worker or drone cells.
- \* Queen lays fertilized egg in worker cells, unfertilized in drone cells
- \* Queen eggs are always upright in cell bottom

# Larval Stage (Day 4 – 10)

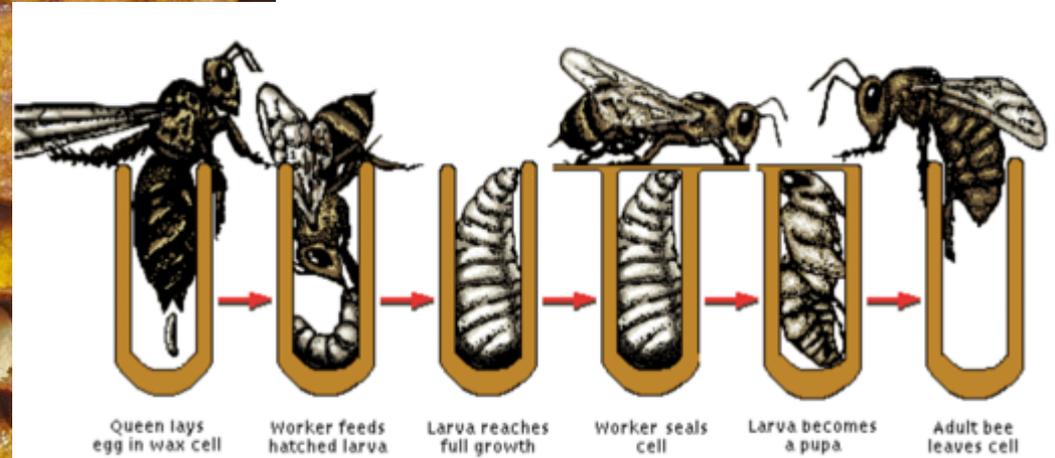


wet  
cells



- Egg hatches (is "born") after 3 days (72 to 84h)
- C-shaped larva (aka "grub" is fed royal Jelly by young nurse bees
- First 24h of larva ("day 4") , royal jelly is fed lavishly (wet cells)
- After day 1, worker bees get mixture of honey and pollen
- Queens develop if fed royal jelly continuously *and* provided long cell
- Drones get more pollen in mixture
- Day 8: Cell is capped for worker bee

# Pupa Stage (Day 11 – 21)



- Brood capped after day 8
- Larva becomes pupa around day 11
- Complete metamorphosis
- Mites can be present in pupa stage



# Capped Brood Images

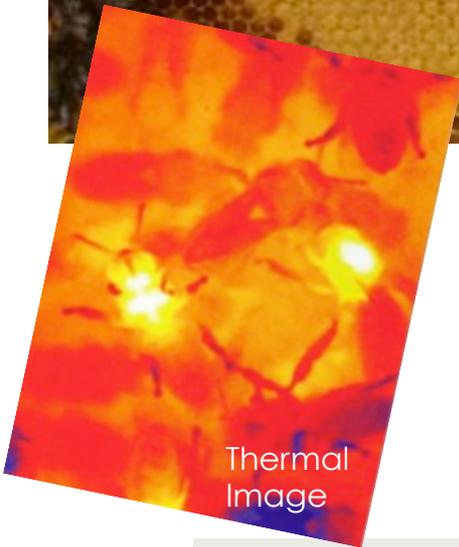


Normal

Spotty

- 5-10% empty cells are normal
- Heater bees use empty cells to keep brood warm
- Good queen lays solid pattern  
( brood of similar age is contiguous)

Thermal  
Image



# Capped Brood – Drones & Laying Workers



Yellow = Worker  
Red = Drone

Signs of laying workers:

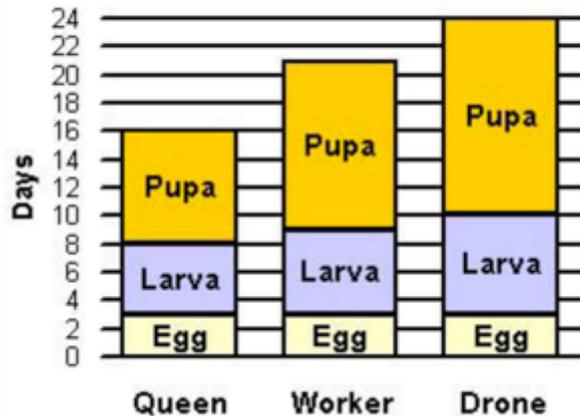
- Spotty brood pattern
- More than one egg per cell
- Egg position on side or off center
- Sure sign: Drone brood in worker cells



# Development Stages Summary

Type (Caste)	Egg	Larva	Cell Capped	Av. Dev Period	Fertility Start
Queen	3	5.5	8	16	≈23
Worker	3	6	12	21	n/a
Drone	3	6.5	14.5	24	38

Development stages of the Queen, Worker and Drone.



(Days)

# Inside the Bee Kitchen

- **Nectar** – Energy source, stored in special honey stomach
  - Special valve can connect to digestive stomach
  - Can load up to own “dry weight” visiting 1000 plus flowers
  - Field bee offloaded into recipient bee’s honey stomach
  - Enzymes break up complex sugars and gives honey long shelf life
- **Honey** - Cured through forced evaporation (80% → 17% H<sub>2</sub>O)
- **Pollen** – Protein and other nutrients
  - Stored in baskets on hind legs. In comb mixed with nectar or honey
  - Fermented product called *bee bread* – highly nutritional
- **Royal Jelly** – Secretion from glands in worker bees head
  - Fed to all larvae on first day, queen maker
- **Propolis** – Resinous mixture collected from tree buds
  - Used as sealer, has antimicrobial properties

# Wet versus Dry Capping



- \* Once honey is cured, thin layer of wax caps cells
- \* Unlike brood caps, honey is capped many square inches at a time
- \* Italians produce white caps, Caucasians produce “wet” caps

# 3) Swarm Management

■ An old English ditty says:

A swarm of bees in May is worth a load of hay;

A swarm of bees in June is worth a silver spoon;

A swarm of bees in July isn't worth a fly.

*....for it is then too late to store up honey before the flowers begin to fade.*

*[1879 R. Jefferies Wild Life in Southern County]*

# Swarm Management

- Swarming is natural response to congestion and expansion
- Remaining hive
  - Reduces hive strength
  - Known properties of new queen are now diluted
  - Loss of surplus honey for remaining hive
- If strong hive with swarming tendencies: Consider split
  - + New colony
  - Little surplus honey in split year if done late in spring
- If spring swarm is caught
  - + Resets mite cycle, healthy cleansing
  - + Motivated bees, often surplus honey available

# Swarming Signs

- ❑ Vacant queen cups are occupied
  - ❑ If colony is in two brood boxes, the swarm cells will almost always be found hanging from the bottom of the upper row
- ❑ Strong colony honey bound or space constrained
- ❑ Queen is in her second year



Regular vacant cups



Occupied,  
floating in royal jelly



Supersedure emergency  
cells, no swarming

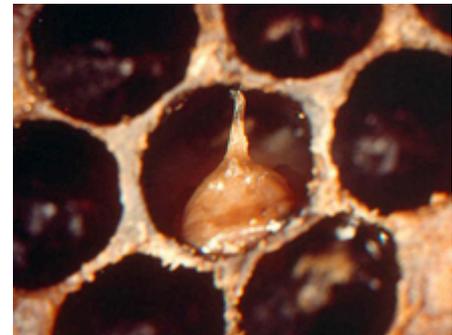
# Swarm Prevention

- Frequent inspections in spring time
- Allow for more brood space by checker boarding
  - Alternate empty frames with brood frames
- Checker board full honey frames with empties
  - Hive perceives checkered honey stores as incomplete & will not swarm
- Experts only:
  - Split hive, create packages & nucs !
- If everything fails, have a few lures nearby to catch swarm (\$3 lure →)



# 4) Bee Diseases

- Bee inspection: Check for queen (eggs?) & hive health
- Varroa mite still biggest threat to small scale bee keeper
- American / European foulbrood – burn frames
- Nozema (dysentery) – reduce stress, keep bees more sterile
- Colony Collapse Disorder (CCD) not big issue for small beekeepers
  - Do not keep bees next to fields with heavy pesticide use
  - Neonicotin pesticides most likely cause
  - Recently 3 neonicotins banned in Europe



Foulbrood

# Varroa Destructor

- Varroa destructor mite (related to Varroa jacobsoni)
  - Jumped from natural host Apis cerana to Apis mellifera in the 60ties
  - Sucking hemolymph leaves open wounds on bee
  - Weakened bee prone to infections and bacterial diseases
  - Serious pest can wipe out hive in fall when drone rearing stops
- Mites reproduce in 10 day cycles, prefer drone brood
  - Mites hatch and leave cell with host
  - Some Russian strains have more resistance
  -  Bees with varroa-sensitive hygienic traits are being “developed”



# Mite Control

## ■ Chemical Measures

- Naturally occurring: Formic acid (Mite-Away II) most promising
- Oxalic acid trickling or vapor
- Treat when 24h mite count exceeds 30 mites on check board

## ■ Physical / Mechanical/ Behavioral

- Perforated / screened bottom board
- Comb trapping – interrupts brood cycle. At 9-day intervals queen confined to new comb. Capped brood removed – 80% efficient
- Freezing drone brood (and return dead for cleanup)
- Excision method: Good for top bar hives  
Cut off drone brood found at bottom or outer edges



# Mite Away Quick Strips Summary

## *Mite-Away Quick Strips™*

For Treatment of Honey Bees Infested with Varroa Mites

### Active Ingredient

Formic Acid (including formates)....	46.7%
<u>Other Ingredients.....</u>	<u>53.3%</u>
Total.....	100.0%

**KEEP OUT OF REACH OF CHILDREN**

**DANGER-POISON –  
CORROSIVE TO SKIN AND EYES**



- + Highly effective, >80% mite drop
- + Honey supers can stay on
- + \$5 per treatment, 2/y typ
- No prevention, just kills
- Over 50% “Other Ingredients”
- Wear face mask, don’t inhale



# Mite Control - Heat Treatment

- Allows a thermal treatment at the beginning of season or any time
- Does not kill brood or bees
- Promises chemical free treatments
- Still in development stage



<http://www.ecodesign-company.com>

# 5) Equipment Use Review

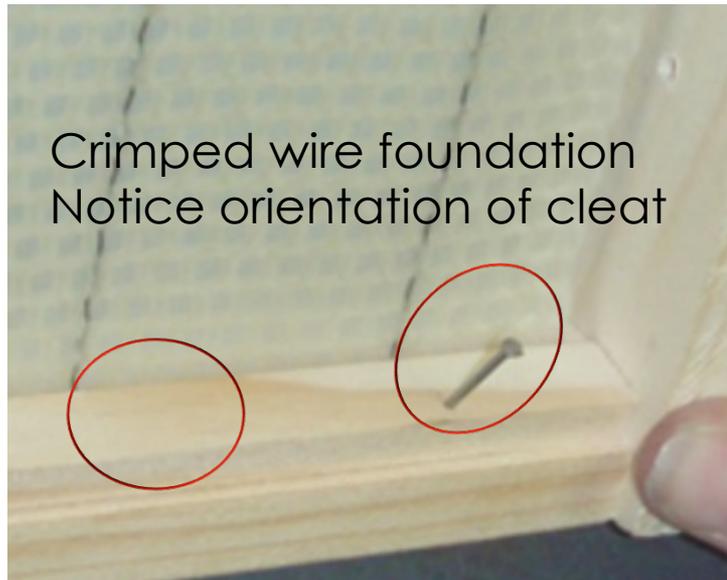
Characteristic	Top Bar	Langstroth	Comment
Hive Management	**	****	
Harvesting Honey	**	***	Extractor only for LS
Ventilation	**	***	LS better chimney effect
Standardization	*	*****	LS quite interchangeable
Cost	****	*	\$20 per top bar hive possible
Easy on your back	****	*	Consider 8 frame LS
Moving hives	*	***	LS easier to de-construct
Naturalness Factor	***	**	Harvest cut comb from TB
Beauty Factor	****	*	Can look gorgeous

Adopted from <http://mistressbeek.com/2010/09/19/top-bar-hive-vs-langstroth/>

# Replacing Foundation – The Cleat and Rabbit Story



Wedge cleats differ



Crimped wire foundation  
Notice orientation of cleat

Note nailing wide side of cleat



Grooved bottom bar (left) easy to clean



Torch mite eggs  
in rabbit (channel) area

# Frame Foundation

- Ready Made Frames versus Assembly (\$\$ vs. \$)
- Small Cell - Effective in controlling mites?
- Foundation Types
  - Beeswax + most natural - will buckle in deeps without wires
  - Beeswax w/ crimp wires + natural & sturdy for mediums
  - Duraglit + durable, has some beeswax coating
  - Plastic + most durable - clogs landfill
  - Top bar in Langstroth + natural all the way - harder to harvest
- Issue of Replacing Foundation
  - Significant effort & time cleaning grooves and disinfecting)
  - Wedge cleats differ from manufacturer to manufacturer
  - Consider starting with fresh frames to save time

# Example Topbar Hive in Langstroth



- More natural way for brood box
- Jury still out how to harvest honey efficiently

# Want More ?

## ■ Book Recommendations

- The Buzz About Bees by Jürgen Tautz
- Beekeeping in Coastal California by Jeremy Rose

## ■ Consider Becoming a Master Beekeeper

- <http://extension.oregonstate.edu/mb/>
- <http://www.masterbeekeeper.org>

## ■ Attend Classes at UC Davis

- <http://entomology.ucdavis.edu>

Thank You !



# APPENDIX

# EU Restrict 3 Pesticides

- Neonicotinins made by Bayer etc. most likely cause of CCD
- 2.6 million signed petition
- Ban in place for 2 years pending review
- Announced 29 April 13



bee featured in The Independent

# Fun Facts: Vibrating Gyroscope 1/2

- ❑ Halteres are knobbed hind wings
- ❑ Function as vibrating gyroscope
- ❑ Allows insect to fly straight and level
- ❑ (Bees have front & hind wings)



# Vibrating Gyroscope 2/2

- MEMS Technology mimics halteres
- Rate angle change → capacitance change

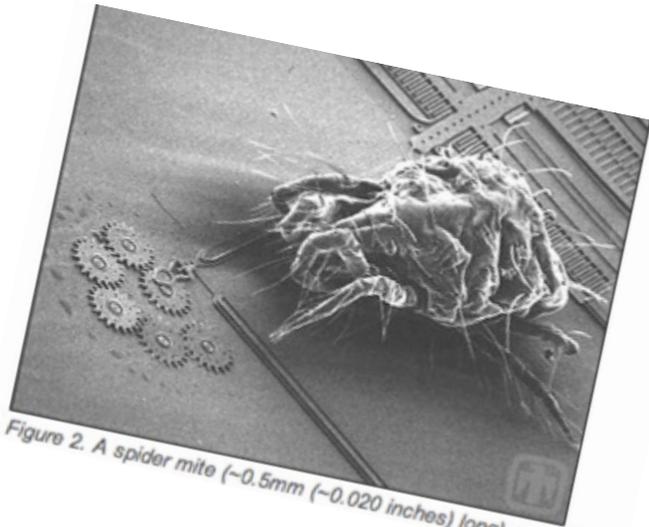
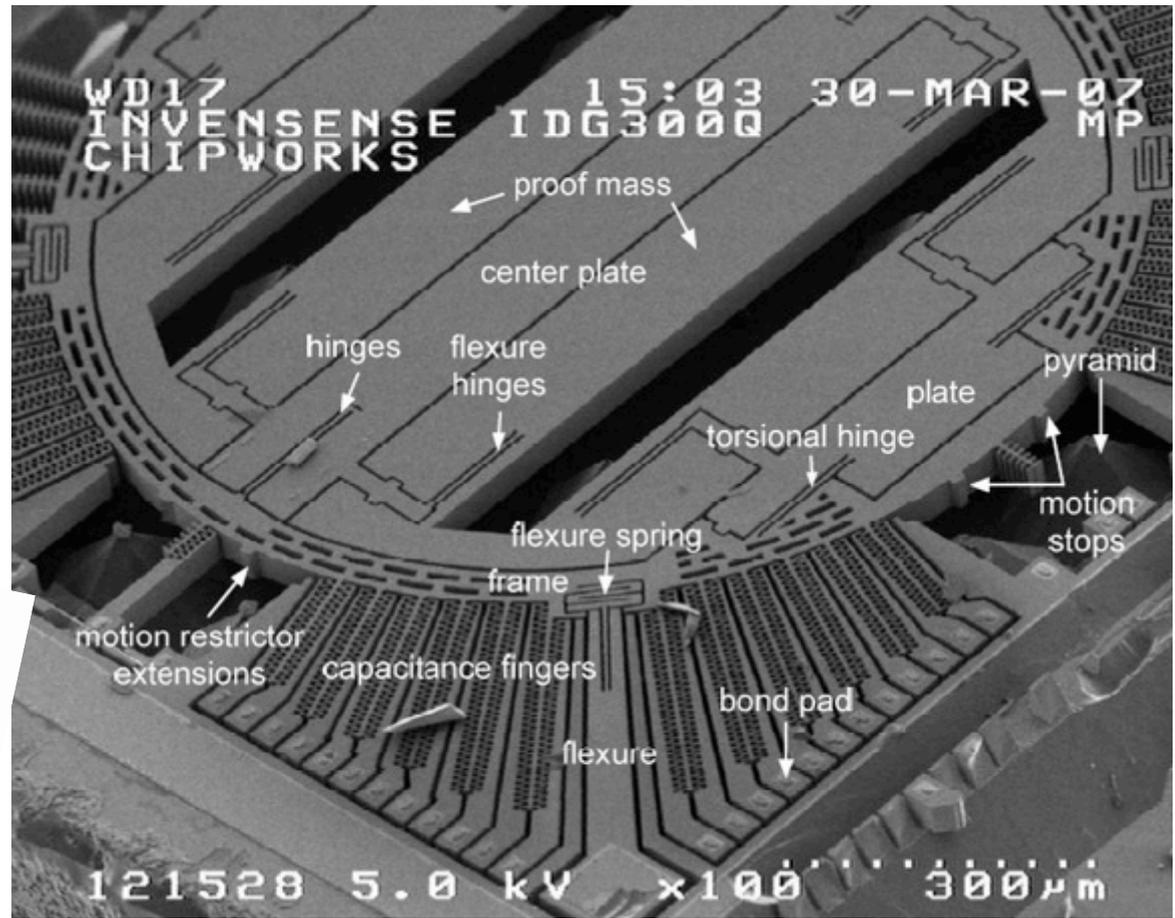


Figure 2. A spider mite (~0.5mm (~0.020 inches) long) on a MEMS

Dust mite for size comparison



MEMS = Micro-Electro-Mechanical Systems on silicon

Thank You !

