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Bee Culture

February Features . . .

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Beehives arriving in CA, ready for the almond bloom. Early January in Pixley, CA. Photo by Matt Summers.

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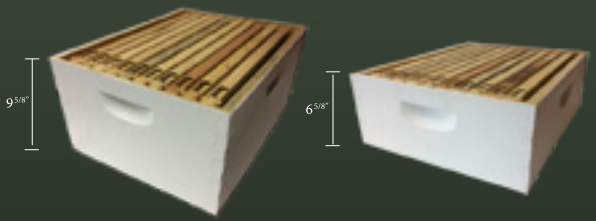

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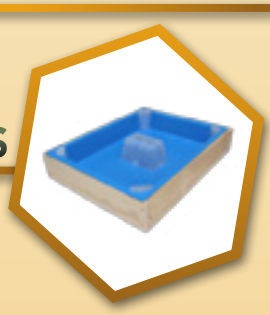

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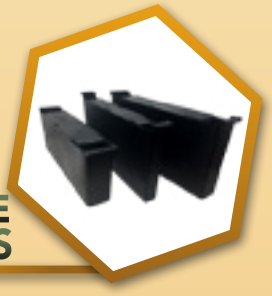

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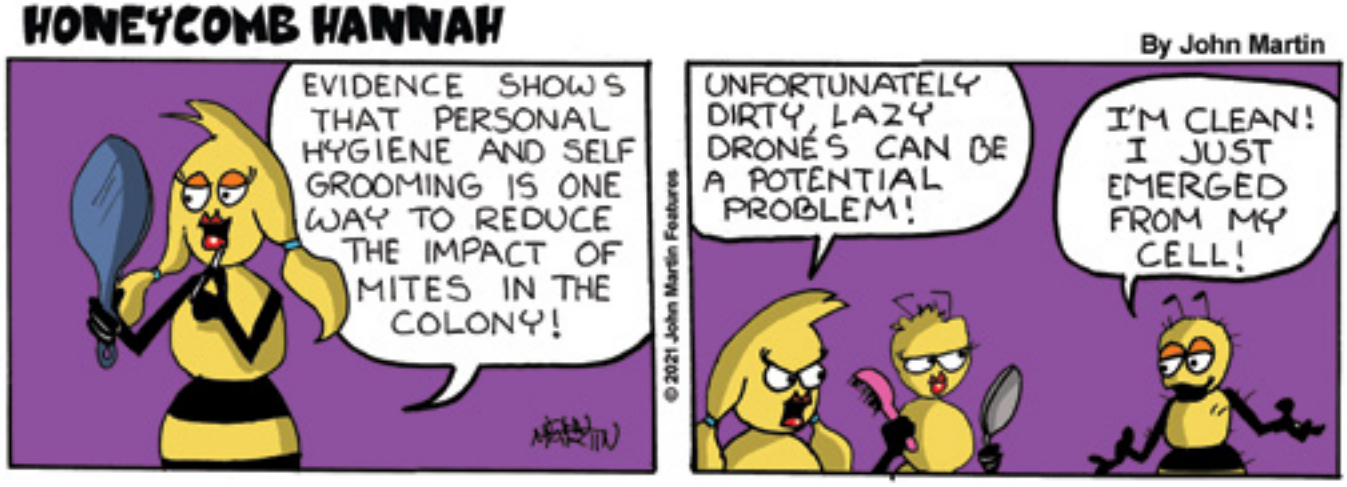
Page 24

In Every Month –



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How To Keep Bees In The Orchard

Is this what we should really be doing to satisfy our perceived "need" to be able to buy/eat almonds 24/7 in every season of the year? I love almonds, usually have some on hand, but at what point do we stop manipulating mother nature, which I believe is behind the increasing degradation of ecological integrity throughout much of the world, be it with our honey bees or depletion of our soils and waters with monocultures dependent on pesticides, herbicides, fungicides. Most beekeepers are losing increasing numbers of honey bees each year, and several of our native bumble bees throughout the U.S. are in decline. If we don't have viable numbers of a diversity of pollinators, we humans are soon to be in irreversible trouble. As E.O. Wilson famously said "it is the little things that run the world" – we may not survive, but I have no doubt that the last living creatures will have six legs.

Margot Monson

Varroa Resistance

I enjoyed reading Terry Combs article on "*Varroa* Resistance" in the October 2020 issue of *Bee Culture*, pg. 76. I have been keeping bees for 36 years and for 30 years I have practiced beekeeping by "maternal line survivorship without chemicals." Over the years I have taken my lumps, but as Terry has experienced yearly colony losses have improved and are at acceptable levels.

Also, on page 19 of the same issue, Ross Conrad commented that "Old time beekeepers for example knew how to control and eliminate American and European Foulbrood without the need for antibiotics..." Would Ross be willing to expand on this topic? I, too, believe we need to relearn some of the old ways.

Tom Ferguson

New For Your Bees –

STRONG MICROBIALS LAUNCHES NEW PROBIOTIC TO PROTECT HONEY BEES FROM PESTICIDES

New Scientific Research Shows That Pediococcus (P801) Improves The Survival of Honeybees Exposed to Pesticides

Strong Microbials, the original creators of the first probiotic for honey bees, have improved the already successful, **SuperDFM®-Honeybee™** est. in 2014; based on exciting scientific research that shows Pediococcus acidilactici (P801) helps rescue honey bees who have suffered pesticide exposure. That's why Strong Microbials researched and developed SuperDFM®+P801™ for commercial pollination.

According to a USDA survey[1], 98% of honey bee comb and foundation in North America were contaminated with an average of six different pesticides. Exposure to sublethal concentrations of pesticides can significantly shorten honey bee lifespan, weaken immunity, decrease colony population, and cause precocious foraging.

There is an accumulation of evidence supporting probiotic bacteria's benefits, specifically, lactic acid bacteria's ability to strengthen and stimulate the immune system while aiding optimal nutrient absorption. The bacterial composition of **SuperDFM®+P801™** is a massive breakthrough in combating the "4 Ps" that are harming honey bees: parasites, pesticides, poor nutrition, and pathogens.

A new study[2] published in February 2020 found that Pediococcus acidilactici can rescue honey bees from pesticides' adverse effects. Honey bees exposed to boscalid + thiamethoxam, a few of the pesticides formulated into products such as Cruiser® and Pristine®, resulted in a 41% mortality rate. In comparison, honey bees exposed to these pesticides and treated with Pediococcus only saw a 15% mortality rate.

"We've been testing this strain of Pediococcus acidilactici since 2017. This publication was important because it emphasized the connections between pesticides and pathogens," said Slava Strogolov, the CEO of Strong Microbials.

In March 2020, the University of Florida conducted a field trial with Strong Microbials' SuperDFM®+P801™. This study followed sixty hives for two months. In the end, it showed that hives treated with SuperDFM®+P801™ showed a significant improvement in hive weight and a tendency towards better survivorship. Twice as many colonies in the control group died compared to the hives supplemented with SuperDFM®+P801™.

EAS Master Beekeeper Carol Hoffman said that "The fungicide use in the California Central Valley increased in recent years, affecting bee health. Beekeepers need to find new approaches to keeping healthy bees."

SuperDFM®+P801™ is now available for pre-order through the website **StongMicrobails.com/superdfm-p801**.

Shipments will begin in early January 2021, with delivery to California in time for almond pollination.

For additional information, please reach out to **info@strongmicrobials.com**.

Strong Microbials is an innovative biotech company that develops premium probiotics for agriculture known as DFMs (Direct-fed Microbes) and soil and crop inoculants. Strong Microbials knows that microbes are crucial to re-establishing the harmonious balance eroded by pesticides, fungicides, herbicides, antibiotics, and other modern farming practices. Visit StrongMicrobails.com to learn more about microbes and how to test DFM quality.

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1. **https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0009754&type=printable**
2. **https://www.sciencedirect.com/science/article/abs/pii/S0048357519304894?via%3Dihub**

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TRUE SOURCE HONEY TO UPDATE CERTIFICATION STANDARDS IN 2021

The True Source Honey program will enhance its standards starting Jan. 1, 2021 to better address honey authenticity.

The updated standards will note that True Source Certified Honey whether imported to North America or purchased directly from North American beekeepers is tested for authenticity by an accredited laboratory at some point in the supply chain using either EA/LC-IRMS and Nuclear Magnetic Resonance (NMR) profiling or EA/LC-IRMS and High Resolution Mass Spectrometry (HRMS) analysis. This is in addition to the long-established pollen analysis requirements for shipments of honey from countries identified as high-risk.

"The True Source Certified standards previously required its packers to maintain a system to analyze honey authenticity, but had not specified exact testing methodologies," said Gordon Marks, executive director of True Source Honey. "The new standards specify authenticity testing which utilizes longstanding approved methods along with cutting-edge technologies to detect sugar/syrups."

"True Source Honey launched the True Source Honey program 10 years ago in response to illegal shipments of honey from China. The honey claimed to be from other countries to avoid U.S. tariffs on Chinese origin honey," said Marks. "While most honey comes from high-quality, legal sources, adulterated honey and illegally sourced honey remains a global issue that undercuts fair market prices and damages honey's reputation for quality and safety."

The True Source Honey Certification Program is a voluntary industry program.

NSF International, a global public health and safety organization and independent certification body for the food industry, conducts the auditing and certification for the True Source Honey program worldwide.

True Source Honey LLC is a voluntary effort by honey packers, importers, exporters and beekeepers to support transparency and authenticity in honey sourcing. Visit **www.TrueSourceHoney.com** and follow on **Facebook**.

NSF International is an independent, global organization that facilitates the development of standards, and tests and certifies products for the food, water and consumer goods industries to minimize adverse health effects and protect the environment. Founded in 1944, NSF is committed to protecting human health and safety worldwide. BC

For more information: Mary Humann/The Humann Factor LLC **humann@att.net**/970.663.0994.

From The Editor —

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NEXT MONTH

For some of you Spring has Sprung and for others we are still in the depths of – explicative deleted-Winter. What are the first things you absolutely must do and will do when temperatures get above 57°F?

Region 1
- Check Food Supply
- Clean entrance of dead bees
- Watch if Bees are Flying
- Alcohol wash for mites, treat if above threshold of three per 100 bees
- Hope for consistent low temps until real Spring

Region 2
- Is the Queen still alive?
- Is there any brood?
- Feed Sugar Syrup
- Put on pollen Sub.
- Start replacing Queens
- Continue to monitor food resources
- Ensure moisture condensation doesn't create problems
- Hive inspection and assessment.
- Check Candy boards
- Build Nucs
- Sample and treat for *Varroa*

Region 3
- Check food stores, feed if needed
- Are they Queenrite?
- Feed liquid syrup to stimulate Queen laying
- Make splits
- Equalize colonies

Region 4
- Feed if needed
- Manage better in 2021
- Check for *Varroa*, and diseases
- Order nucs or packages
- Check food quantity and positioning
- Reverse boxes if brood in top box

Region 5
- Check Mite levels with alcohol wash
- Treat for mites
- Feed Syrup
- Put on Pollen Sub. Patties
- Make splits
- Check mite levels, treat if needed
- Clean out dead bees on bottom board
- Check to see if any mice are living in hive

Region 6
- Check for colony activity, or not, at entrance
- Feed syrup and patties
- Remove Deadouts
- Feed and feed some more
- Sample and treat for mites

Region 7
- Feed, Feed, Feed
- Is colony still alive?
- Alcohol wash mite count
- Treat if mite count is above three per hundred bees
- Get ready to split

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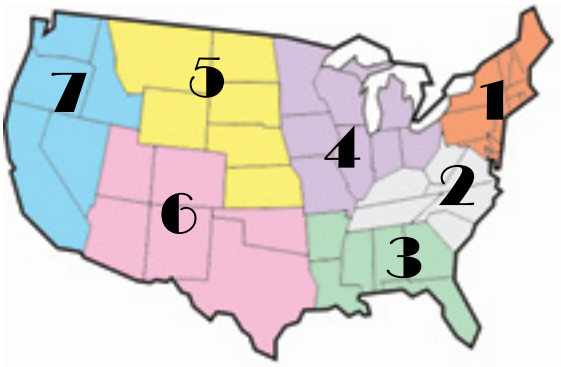
FEBRUARY – REGIONAL HONEY PRICE REPORT



	REPORTING REGIONS 1	2	3	4	5	6	7	SUMMARY Range	Avg.	$/lb	History Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS												
55 Gal. Drum, Light	1.96	2.17	2.15	1.96	1.75	1.90	2.00	1.70-2.17	1.98	1.98	2.21	2.24
55 Gal. Drum, Ambr	1.67	2.14	2.00	1.67	1.67	1.44	1.85	1.00-2.14	1.77	1.77	2.12	2.09
60# Light (retail)	176.86	188.00	190.00	165.00	175.00	168.50	202.50	138.00-205.00	182.22	3.04	207.21	211.90
60# Amber (retail)	188.28	186.00	190.00	188.28	188.28	170.33	212.47	132.00-240.00	190.55	3.18	209.81	209.94
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	101.20	74.50	99.75	88.00	75.50	89.75	88.50	72.00-140.55	106.15	9.42	92.31	96.89
1# 24/case	116.34	109.40	100.00	130.00	152.50	106.95	120.00	45.00-185.00	117.68	4.90	140.38	139.60
2# 12/case	111.57	98.00	94.00	123.00	111.57	114.00	132.00	94.00-132.00	110.14	4.59	125.67	125.19
12.oz. Plas. 24/cs	74.08	109.75	80.00	101.00	120.00	53.40	69.67	54.00-120.00	83.66	4.65	103.44	100.86
5# 6/case	109.15	110.50	129.00	110.85	112.51	140.25	174.21	99.00-240.00	105.45	4.55	147.90	131.36
Quarts 12/case	158.01	143.88	125.00	95.00	187.50	157.20	183.00	95.00-231.00	153.01	4.25	162.94	146.56
Pints 12/case	93.28	80.70	65.00	93.28	105.00	108.00	96.00	60.00-138.00	87.55	4.86	99.86	103.72
RETAIL SHELF PRICES												
1/2#	5.50	5.30	4.25	5.00	7.85	5.47	5.60	3.00-8.00	5.44	10.88	5.51	5.27
12 oz. Plastic	6.77	6.87	6.19	6.00	5.50	5.44	6.93	4.50-10.00	6.29	8.38	6.62	6.17
1# Glass/Plastic	8.67	8.40	9.17	8.00	10.00	7.72	8.50	5.89-12.00	8.39	8.39	8.48	8.08
2# Glass/Plastic	14.36	14.50	17.33	14.00	14.36	12.63	14.80	6.89-21.50	14.53	7.27	14.59	13.36
Pint	10.42	9.83	9.00	11.00	12.25	9.60	12.30	6.00-15.00	10.34	6.89	11.29	10.03
Quart	18.19	17.75	16.75	18.00	21.00	15.98	18.58	12.00-25.00	17.88	5.96	18.56	16.72
5# Glass/Plastic	31.97	27.00	42.50	29.00	31.97	27.63	31.97	17.89-50.00	29.99	6.00	31.85	29.27
1# Cream	10.73	8.75	14.00	10.00	10.73	10.73	12.00	8.00-14.00	10.46	10.46	10.92	9.90
1# Cut Comb	14.00	10.25	13.98	20.00	10.00	15.50	17.00	8.00-25.00	13.49	13.49	13.99	11.72
Ross Round	12.25	6.99	12.25	19.00	10.00	12.25	12.50	6.99-19.00	11.50	15.33	11.73	11.33
Wholesale Wax (Lt)	8.07	5.29	7.00	8.07	6.00	4.00	8.33	4.00-15.00	6.65	-	6.91	7.11
Wholesale Wax (Dk)	8.21	5.00	6.00	8.21	6.00	2.75	18.00	2.00-18.00	6.43	-	5.06	6.21
Pollination Fee/Col.	92.05	60.00	52.50	65.00	200.00	92.05	50.00	30.00-200.00	69.09	-	93.57	95.43

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It's Summers Time –

Random Thoughts

Winter seems a little more harsh this year than some. I'm sitting here with my hand warmers on and my blanket around my lap. Maybe it's just me getting older and more vulnerable to the cold. Here in Ohio January (as I write this) tends to be one of the 'grayest' months. We don't get a lot of sunshine and we've all been told how that affects us mentally and emotionally.

But then a few days after Christmas we got our first seed catalog and then another and another. One friend of mine compared it to when we were young and we got that Sears catalog before Christmas and sat down with our pens and marked all the things we wanted. And just like that I mark way too many things. Kim has placed his first order and seeds are arriving today.

So once again we are hopeful – we know that Spring is coming! And we hope it's going to be a very different year. Can you believe it's been almost a year that we've been actively dealing with this virus thing. A whole year! It's been a hard one for many of us. We all know someone who has been impacted by this and many of us have lost a loved one or more.

Just a week ago – early January – my son, Matt sent me photos of the beehives arriving in California for the almond pollination. He lives about an hour north of Bakersfield. He actually arrived there last year around mid-February and got to witness this event. It's incredible. The cover photo and the one below were taken by Matt in Pixley, CA. I haven't seen Matt for awhile so I'm hoping to make it out there as soon as it's safe.

We lost another friend to the nasty cancer monster – Aaron Morris. I can't remember the very first time I met Aaron. It just seems like I've always known him. Aaron was one of those many friends that we usually only got to see once or maybe twice a year. He was always a big part of EAS when I was Vice Chairman and then sometimes we got lucky and would see him at the ABF meeting.

Bees arriving in Pixley, California early January.

Aaron loved bees, beekeeping and beekeepers. He was loud and funny and just good to be around. Because of the virus we hadn't seen him for about two years. Kim kept in touch with him through email. I kept up with him on Facebook. As you can see by the photo Aaron also really loved Christmas. It was always fun to see his pictures around the holidays. Cancer took him very quickly. We will miss him.

The Spieth Road Poultry Farm is doing okay. We're at 15 chickens (I think) and six ducks. Kim is still restling with the duck behavior issues. He keeps trying different levels of isolation with the aggressive ones. They get quarantined for awhile and then he tries letting them back into the group.

Here's to a hopeful Spring. I'm already seeing that the March meetings are cancelled or going viral. So it's hard to say when we might actually see you in person, but keep a good thought.

I hope your Winter is mild and peaceful.

STUDY HALL

Q — *Hope you are able to answer my question about the newly approved wax moth treatment, Certan. It's thought that using a dark brood comb in a swarm trap is better than just using frames, but those dark, unprotected brood frames are just asking for wax moths to have a meal. Would applying Certan to the combs in the swarm trap, to protect it from the moths, deter the bees from moving in, the way that para moth does?*

Pat Harrison

A – This is the second round for Certan in the U.S. It was available decades ago but dropped because sales would not support re-registration costs. It has been brought back with an updated mixture of Bt strains. It works well and will not discourage honey bees like chemical Wax Moth repellents. Use away. Stay safe and well in these crazy times

Q — *How does a hive know where to send her sons to congregate?*

John Miller

A – I thought the three links below were the most interesting. Short answer is it seems to be multifactorial, meaning we do know that a DCA is many times located at the edge of woods/forest, face of tall buildings etc. so it is location, location, location just like all real estate. But, then how do the drones find the location and that is still up for grabs, pheromones being one supposed way. and ultimately 'we' still do not know the complete story. **https://jeb.biologists.org/content/217/8/1278.short; https://www.jstor.org/stable/25085360?seq=1; https://link.springer.com/article/10.1007/s00040-004-0763-z**

UPDATE From Bill Fredrick: ApiGuard *Varroa* Control: OK, I have some results for you Jerry, regarding the late season ApiGuard treatment, here along the Maryland/PA state line. I was concerned that it would be too cold to be effective (November), but, per your suggestion, applied the ApiGuard to three hives to try it. The results are very good (though the sample size is small). Note: we had an unseasonably warm October and early November here, which likely helped.

Hive #1

3.5% mite load, per alcohol wash sample 10/20

50ml applied 10/22 and 50ml 0n 11/5

0% mite load, per alcohol wash sample 11/21

Hive #2

4.0% mite load, per alcohol wash sample 10/20

50ml applied 10/22 and 50ml 0n 11/5

0% mite load, per alcohol was sample 11/21

Hive #3

3.0% mite load, per alcohol wash 10/20

50ml applied 10/22 and 50ml 0n 11/5

TBD. I ran out of time to perform the alcohol was and subsequent days were too cold to open the hive.

Because of the warm Fall and the hives have young (July/August) queens, I see they still are raising some brood. This makes the typical annual oxalic acid vapor cleanup treatment in late Nov. not so effective. This was my first year using ApiGuard and I am very pleased with the trial results that I ran this Summer. Combined with its effectiveness in the Fall, I plan to use ApiGuard much more extensively across my operation next year. Please to have another effective tool against *Varroa.*

Q — *Honey bees existed before the last ice age in North America according to the fossil record.*

Would plants have co-evolved with Honey Bees during this time to produce flower shapes, sizes and nectar production to enhance this relationship?

Would those plants in North America still exist and be helping beekeepers (commercial) produce large honey crops in non-urban, non-suburban, and production agricultural areas?

Thank you in advance.

Mayli Archibald

A – (I went to Dr. Keith Delaplane as the expert)

The paper referred to is Engel, M. et al. 2009. A Honey Bee from the Miocene of Nevada and the Biogeography of *Apis* (Hymenoptera: Apidae: Apini). Proceedings of the California Academy of Sciences 60(3): 23. The authors report a fossil member of the genus Apis in Nevada shale dating from 23-5 million years ago. It arrived over the Bering land bridge and persisted until the Pliocene or Pleistocene epochs ~ 2.5 million years ago. The continent remained *Apis*-free thereafter until European colonizers reintroduced *Apis mellifera* in historic times.

The ancient presence of *Apis* in North America leads to the reader's question whether modern plant groups persist that retain the thumbprint of coevolution with their extinct *Apis* pollinators. Although the question is reasonable, in principle we would be hard-pressed to know a flower/*Apis* partnership if we saw it. This is because flowers and pollinators range across a spectrum from specialist to generalist. A generalist such as *Apis* will, by definition, visit a wide range of plants, and generalist plants will by definition resist adaptations that make their flowers accessible to only a subset of pollinators.

If the relationship were specialized, one could expect to see a simultaneous contraction of both the pollinator and its host plant – and again we might not see either in modern times because of mutual extinction.

What tends to happen, however, is a general break-down in the tidy categories specialist and generalist. An individual of a generalist pollinator, say a honey bee forager, may become a functional specialist, visiting only one species of plant her entire life. On the other hand, even "specialist" plants tend to be visited by a number of flower visitor species at a local scale. If I were to summarize, I'd say that specialization is adaptive in the short-term, while generalization is more favorable to ecosystem-wide stability in the long-term. Pairs or groups of species may shift together (co-specialize) or apart (generalize) over time (see Brosi, BJ, 2016. Pollinator specialization: From the individual to the community. New Phytologist 210: 1190). Not an easy system for tracking in the long-term I'm afraid.

Excellent question.

Q – *Quick question: all Summer long I don't have any issues with bees on my hummingbird feeders, until the last few days. My feeders are loaded with bees and they are aggressive. Any reason why?*

Janet Treder

A – I'm not sure where you may be located but the generality is that when the days are getting shorter, Winter is coming, flowering plants are finishing up and there are not natural resources for honey bees except what you have trained them on with your hummingbird feeder. The bees represented at the hummingbird feeder may represent multiple colonies that are competing for this last food resource and when honey bees or humans compete, they get aggressive and defensive.

Q – *How far from the apiary should a swarm box be placed? Given that bees will travel two to three miles looking for a possible home site, does it make sense to locate a swarm box within a mile of the apiary? Will old foragers in the swarm eventually recognize old landmarks and return to their original hive site? Ken Sikora*

A – This is a Real Estate issue for a swarm. Its location, location ,location

The scouts of the swarm are looking for a location and a space that has the appropriate volume so the colony can grow and swarm again next year to spread their particular genetics around if they in fact do survive that long. It is all a Darwinian experiment. The best volume of a swarm trap/box should be similar to a Deep Hive body. Honey Bees have great odor receptors and recognition. The box should have a recognizable odor of beeswax and propolis. A frame of drawn comb is helpful placed inside the swarm trap. Some beekeepers put lemongrass oil on a cotton ball to advertise this location to swarm scouts. The box should be approximately 8'-10' vertically up in a tree or unused deer stand or – and on the edge of a wood line. Distance from the apiary where the swarm(s) may emerge from can be from a 100 ft to an mile. We beekeepers like things closer so a min. couple hundred feet can work.

There won't be many 'old foragers' in the swarm Ken. There may be some who get caught up in the excitement but not many. The swarm is designed to be new young bees who can handle the stress of this move and establish a colony and have it grow. Honey Bees are always preparing for winter so an early start in Spring and young healthy bees is the metric to build up to make it through a long hard cold Winter.

Q – *This item was discovered in an old garage. Would anyone in your organization be able to identity these two items? One is an old hand-cranked extractor and I have no idea if the other item has anything to do with honey.*

Thanks for your assistance!

Jeff Collins, Galion, OH

A – Jeff I have copied the ultimate historical expert on beekeeping equipment, Jim Thompson.

Jeff and Jerry,

This is fairly easy in some respects. The word "Novice" was A.I. Root's pen name and he used it on the articles that he wrote and on most of the equipment that he made. The filigree bracket that steadies the top and the crank was only used on

the models that were made between 1879 and 1892. However A.I. made 10 models of extractors that used that bracket. In 1893 the top crank was changed as the filigree bracket kept breaking. Thus many of these extractors became unusable because the bracket and crank were parts that could not be replaced. There were over 10,000 extractors in use. I copied some of the pages out of three of the catalogs that tell of the different models and the use of the extractors.

Why the different type of extractors? Because beekeepers used different types of hives and Root made six of the commonly used frames until everything got standardized by the Langstroth frame. During the time frame of this extractor, the frames sat in the extractor exactly like they sat in the hive except for the frames that were longer than their height. The longer frames sat vertically with the long side up and down. That meant that there were three different heights of cans for the extractor. However if you extracted a bunch of honey and kept the valve shut, the honey in the tank would interfere with the spinning frames so deeper tanks could be made on special order. The extracting efficiency on the shorter frames was not as great as they would be sitting in the extractor with the natural 10 to 14 degrees that bee build into the comb interfering with the centrifugal motion. You would have to measure the tank and the baskets to determine which model you have. I would guess that it is model five.

Oh, did I mention that if you were the initial buyer of the extractor, an uncapping knife came along with it.

I hope that this answered your question. *Jim Thompson*

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FOUND IN TRANSLATION

Food Security For Honey Bees

Jay **Evans**, USDA Beltsville Bee Lab

Honey bees provide humans with food security, but what does it take to ensure nutritious and safe food for their own livelihoods? Bee fans from an early age know honey bees and other pollinators require pollen and nectar from flowering plants. From there it is intuitive that the abundance and nutritional quality of both will translate into better colony growth and reproduction. What is still debated is how to achieve quality and quantity at the landscape level, given competing bees and competing interests. One long-running effort to address this debate at a practical level has been made by U.S. government and University scientists working with land managers and beekeepers in the Northern Great Plains region of the U.S. This region in the eastern halves of North and South Dakota and extending East and South into Minnesota and Iowa, includes vital bee grounds for a third of U.S. honey bee colonies. Historically a region of high honey yields and numerous commercial beeyards, the NGP has shifted towards managed crop agriculture in recent decades. Dr. Clint Otto and colleagues at the U.S. Geological Service, with others from USDA and nearby Universities, have recently summarized 10 years of research aimed at understanding how forage availability impacts bee health in the short and longer terms. The results have practical importance for land management but also indicate what drives honey bee growth and survival and how to measure both. Their compilation, "Forage and habitat for pollinators in the northern Great Plains – Implications for U.S. Department of Agriculture conservation programs" (U.S. Geological Survey Open-File Report 2020–1037, 64 p., **https://doi.org/ 10.3133/ ofr20201037**) is freely available and clearly written.

For botanists, the review describes several key papers by this group that use painstaking field surveys, along with genetic and microscopic pollen analyses, to ground-truth how management schemes improve forage for honey bees and other pollinators. Over many years they have found which wildflowers bolster honey bees (clover, clover, clover does the trick for the most part, aided by plants that flower at different times) and which plants are good for all pollinators (a larger salad of species required).

One key study for bee management follows 36 commercial honey bee apiaries sampled in September across three NGP states. Led by Dr. Autumn Smart (now at the University of Nebraska), this project took short-term measures of worker bee health in each environment, along with colony strength measures in both September and the following year prior to grading for almond pollination. The paper, "Nutritional status of honey bee (*Apis mellifera* L.) workers across an agricultural land-use gradient", (*Scientific Reports* (2019) 9:16252) is openly available at **https://doi.org/10.1038/s41598-**

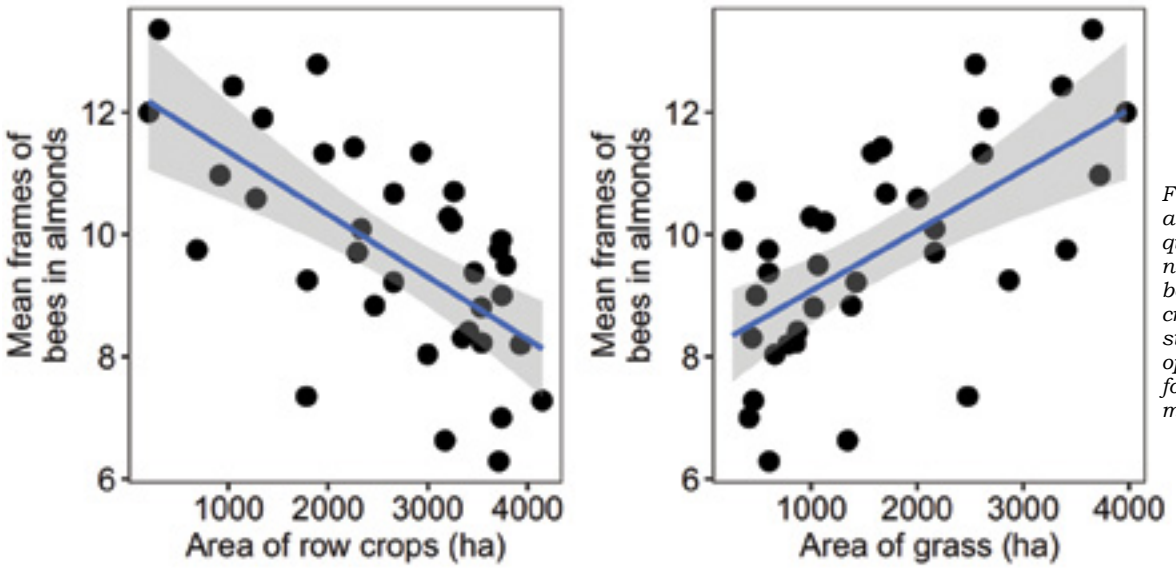


Figure from Smart and colleagues (2019) quantifying the negative relationship between surrounding croplands and colony strength, and the opposite relationship for grasslands and meadows.

019-52485-y. The authors used public data where available, and direct surveys where not, to assess forage quality within four kilometers (2½ miles) of each apiary. The apiaries were surrounded predominantly by row crops or diverse grassland meadows, but the ratios of these land types changed from almost all cropland to almost all grassland.

The four body health measures used were levels of lipids, proteins, sugars, and glycogen in the abdomens of individual bees. Researchers dismembered dead bees and rendered them in various ways to get quantitative estimates of these body components. All four measures trended downward with increasing nearby cropland, although only lipid levels were significantly different. Similarly, all four health measures for individual bees tended to be higher in larger colonies at the time of collection, although none were significantly so. Most importantly, protein levels of individual bees in September were a significant predictor of colony strength the following Spring, as colonies were prepared for almond pollination. Finding a single-bee measurement in one year that predicts later colony growth or survival until the next year is a big deal both for research and as a practical planning tool for beekeepers.

Our group has attempted the same with disease measures and, predictably, *Varroa* levels and levels of key viruses are a pretty good crystal ball for overwinter success and prosperity. With respect to nutrition, the protein vitellogenin is often used as a marker for nutritional health and future prospects. This protein has many roles in bee health, from stress relief to immunity and overall storage of resources for wintering. In short, vitellogenin levels in individual bees are generally a good thing. In another case of grinding bees to save bees, Dr. Cedric Alaux and colleagues in France vetted a variety of bee health measurements as predictors of later colony survival and strength. Their paper "A 'Landscape physiology' approach for assessing bee health highlights the benefits of floral landscape enrichment and semi-natural habitats" is freely available in *Scientific Reports* (2017; 7: 40568, **10.1038/srep40568**). Vitellogenin levels favored overwintering success while mite levels in the Fall were negatively correlated with overwintering success. No surprise there, but this ambitious project connected these and other individual and colony (brood and bee counts) traits with environmental resources for 300+ colonies. They also tested the value of forage supplementation, in the form of 'catch crops' of flowering plants that honey bees like. Both catch crops and the ratios of natural habitat versus crops around each colony favored survival, echoing the work in the U.S. Of the two, simply having more unmanaged land in the foraging range of colonies had the largest impacts on colony survival.

Sampling a soybean field. (Ken Hammond photo)

Back to the USGS study by Dr. Smart and colleagues, while surrounding habitat had modest effects on colony strength in the short term, it had significant effects on the strength of colonies prepped for almonds the next spring. Colonies that had spent the prior year surrounded by row crops tended to be far smaller in terms of frames of bees. This study perfectly describes the compound interest of maintaining bee health, and the decisions beekeepers are faced with up to a year before joining the most profitable and important pollinator event of the year. BC

Bee on Camelina flower. (James Eklund photo)

Winter Reading For You And The Kids –

Applied Beekeeping In The United States, by David MacFawn. Published by and available from Outskirts Press Inc., **www.outskirtspress.com/appliedbeekeepingintheus**. ISBN 9781977232564. Electronic versions available. 342 pages, 8.5" x 11", color throughout, hard cover. $55.95.

You probably recognize the author of this work as he is a regular contributor to *Bee Culture*, *Beekeeping Your First Three Years*, and the *American Bee Journal* magazines. The contents of this book are taken from contributions to those journals, plus contributions to his local beekeeping newsletter. There is also a good deal of information not previously published and is new to the reader. He is active in the Master Beekeeping world, having reached that title in several organizations. He has been active with bees for over 50 years, primarily in the southeastern U.S.

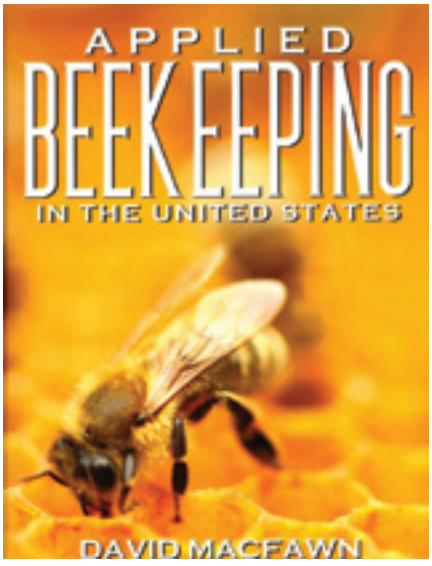
The topics covered, and the information provided in this book are pretty straight forward, but the detail surrounding most of these is pretty intense. On the 342 pages there are 246 photos, showing and explaining the topics of the 49 chapters. Some chapters are actually only photos and the captions that go with them. This book is rich in making sure the reader understands every step of each procedure or technique that is explained. More, I can easily say, than any book on bees and beekeeping I've reviewed on these pages in over 34 years.

Though many of the chapters have been published previously, almost always the magazines they appeared in did not have the room to publish all of the photos sent with the article, and certainly not the room to use several full page photos. I quit counting after only a short time the number of full page photos in this book. As an example, the chapter on installing a package is 15 pages long, and 14 of them are only a huge photo and the caption. I'm impressed with the publisher who designed this book.

This book isn't just for beginners though. I goes all the way from smoker fuel, to moving hives, to installing packages to Summer management to overwintering nucs to laying workers to making candles collecting pollen, to sales and marketing and beekeeping finance. Even if you'll never consider beekeeping as a business, the chapter on finance is worth the time because you can easily get lost in how much money this hobby can cost. There's something here for every level beekeeper. And, if you're just starting out, you'll have advice for every step of your journey.

Though the author has spent most of his beekeeping time in the SE part of the U.S., the information in this book pretty much covers the whole U.S. If there is any area not fully covered, it would be the desert SW part of the country, but most of this can be applied even there.

Kim Flottum



Kaia and the Bees. Written by Maribeth Boelts and illustrated by Angela Dominguez. Published by Candlewick Press. ISBN 978-1-5362-0105-5. 10" x 9", 33 pages, hardcover with dust jacket, color throughout. $22.99, available wherever books are sold.

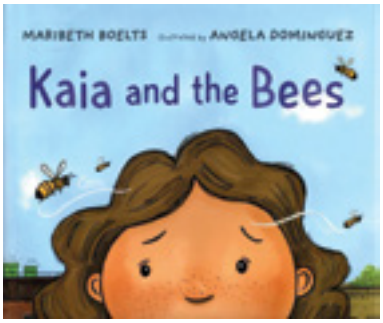
This is a book for children who haven't yet been introduced to bees and beekeeping, or may have had an unpleasant experience with a bee in the past that caused them to be afraid of bees, or at least to view them unfavorably. The author is a beekeeper, and in the book Kaia's father is a beekeeper and they live in the city with several hives on the roof of their home. But Kaia isn't part of that activity, by choice, because she was stung long ago and is afraid of being stung again. However, in all other things Kaia is BRAVE, and claims to not be afraid of bees to her friends, until one day at school she is frightened by a bee and her friends then tease her about being afraid.

To change that, Kaia goes to the roof with her dad, enjoys the wonder of bees, but gets stung, again, and that's it for bees and beekeeping for the rest of the Summer. Brave girl or not.

But then it's time to harvest, and the wonders of honey once again convince Kaia to try bees and beekeeping. You can relate to the issues with harvesting... "there's honey on the floor, on the table, on my elbow, on the door knobs." This will convince you of the author's experience with bees and honey.

What happens then is what makes this such a good story for almost anybody, but especially children with issues with bees. "I'll go to the roof again, because bees are amazing and scary and mysterious. And we need them, and now something inside me is....BRAVE!

Kim Flottum



All The Buzzz in...

Bee B. Queen Challenge

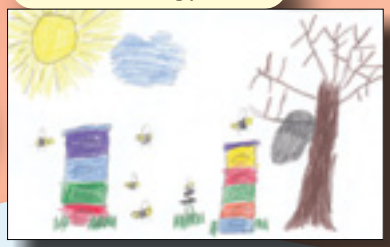
Hello Friends,

Thinking about you with love and kindness!

Bee B.Queen

Be kind to someone.

Walter Kanagy, 6, PA



Dena Sue Wengeld, 11, WI

Body Parts of a Worker Bee

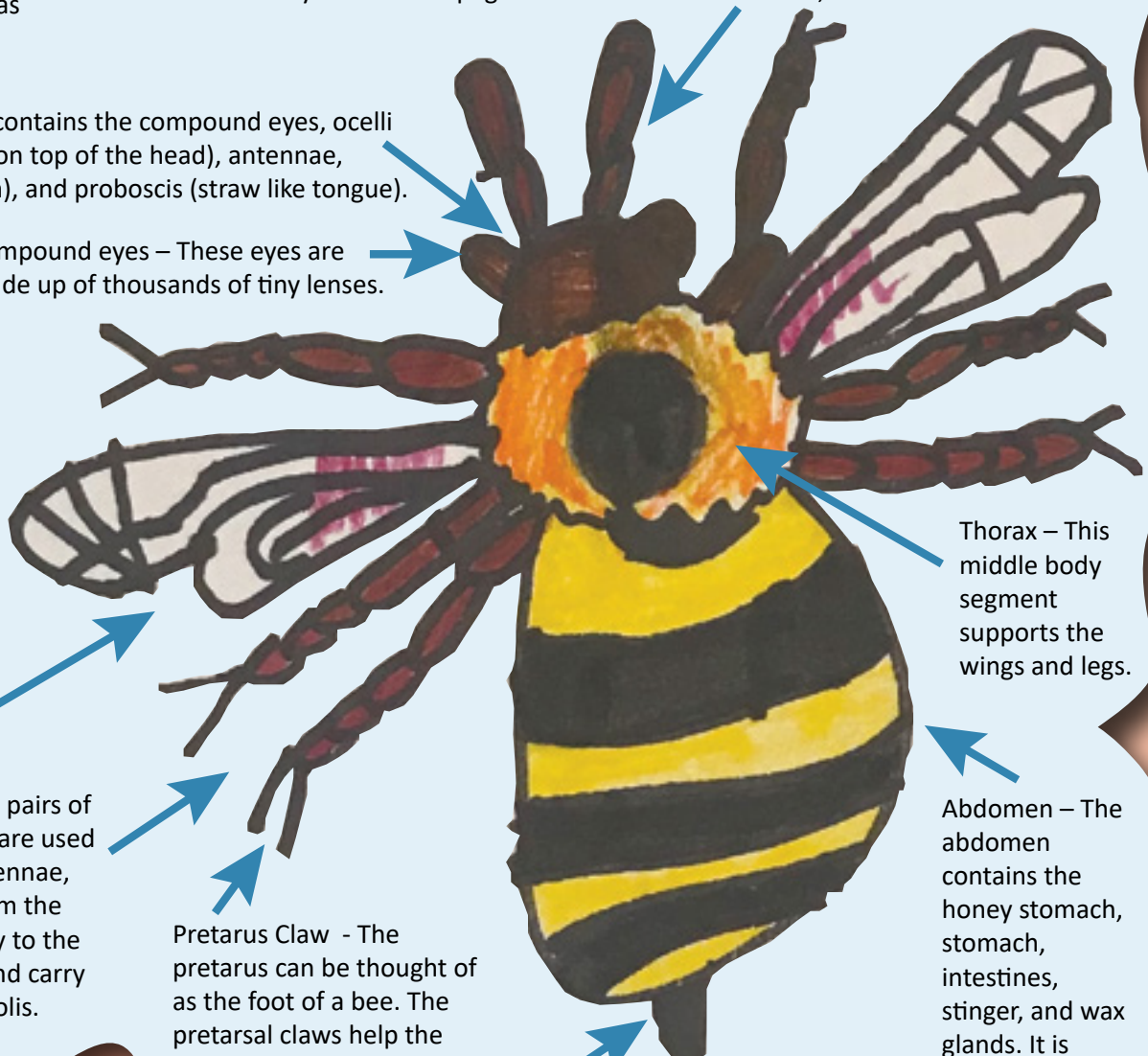
Anatomy – This scientific study describes what the parts of an animal or plant look like. The study of how the parts work is known as physiology.

This bee was drawn and shared by Aly Boles, age 8, from CA. Learn more about Aly on the next page.

Antenna (plural antennae) – Feelers that can detect smell, touch, taste and sound.

Head – The head contains the compound eyes, ocelli (three small eyes on top of the head), antennae, mandibles (mouth), and proboscis (straw like tongue).

Compound eyes – These eyes are made up of thousands of tiny lenses.



Wings – Bees have two sets of wings. The fore wings in each set are larger than the hind wings. The thin wings are strengthened by veins. Each set of wings attach together during flight.

Thorax – This middle body segment supports the wings and legs.

Legs – The three pairs of segmented legs are used to clean the antennae, brush pollen from the hairs of the body to the pollen basket, and carry pollen and propolis.

Pretarus Claw - The pretarus can be thought of as the foot of a bee. The pretarsal claws help the bee hold onto rough surfaces.

Stinger – The worker bee uses the stinger to defend the hive.

Abdomen – The abdomen contains the honey stomach, stomach, intestines, stinger, and wax glands. It is composed of nine segments.

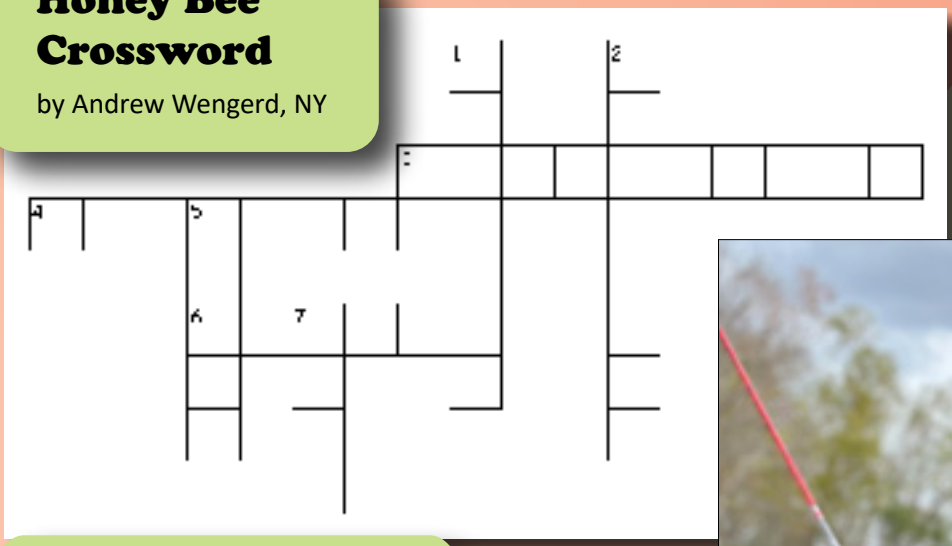
1 flowers, 2 queen bee, 3 worker bees, 4 in a hive, 5 honey, 6 nectar, 7 comb

... Bee kid's corner

Produced by Kim Lehman -www.kim.lehman.com
www.beeculture.com
February 2021

Honey Bee Crossword

by Andrew Wengerd, NY



Across

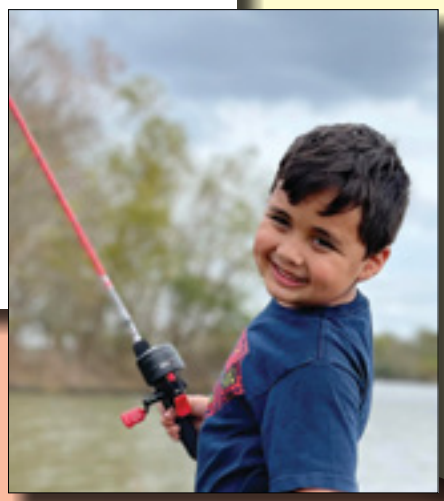
3. Who makes the honey?
4. Where do a beekeeper's bees live?
6. What is honey made from?

Down

1. Where do the bees get the nectar and pollen?
2. What lays eggs but isn't a hen?
5. What is yellow and sweet?
7. Where do bees put the honey before they cap it?

Bee Buddy

Emerson Cerny, age 6, helps his dad keep bees in Louisiana. Honey and peanut butter sandwiches inspired his own honey recipe of putting honey between crackers to make a honey sandwich. Emerson knows much about bees and continues to learn more by asking questions like "Why don't boy bees have stingers?"



Bee Buddy

Aly Boles, age 8, likes to play! She has fun whether she is playing with her dog, playing piano, playing with her friends, or playing in the ocean on her boogie boarding at the beach.

She likes to help her grandpa, Bob Kyle, bottle the honey from his hives.

Beecome a Bee Buddy

Send two self-addressed stamped envelopes and the following information to: Bee Buddies, PO Box 117, Smithville, TX 78957.

Name
Address
Age
Birthday Month
E-mail (optional)

Send all questions, photos, and artwork to: beebuddiesclub@gmail.com or mail to the above address.

Energy Bites

Aly loves to make and eat these treats for breakfast or in the afternoon as a snack.

1/3 c. honey
1/2 c. peanut butter (smooth or crunchy)
1 c. old-fashioned oats
1/2 c. ground flaxseed
1 tsp. vanilla
1/2 c. chocolate chips
1 Tbsp. chia seeds (if you have them)

Stir ingredients together in a bowl, cover, and refrigerate for about a half hour. Use a spoon or hands to form balls about 1 inch in diameter. Place on a parchment-lined baking sheet and refrigerate or freeze, transferring to a container once firm. If you keep them in the freezer, it's better to let them thaw for a few minutes before eating than to microwave them (too messy!) Enjoy!

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A Closer Look

QUEEN QUALITY AND PERFORMANCE

Clarence **Collison**

Queen Failure Often Thought To Be The Cause of Colony mortality

"It is generally believed that a high quality honey bee queen should have the following physical characteristics: high live weight; high number of ovarioles; large size spermatheca; high number of spermatozoa in the spermatheca; and be free from diseases and pests. It is, however, also known that the performance of a colony is the result of its queen's function as well as that of the drones she mated with (Hatjina et al. 2014)."

"Research has shown that the developmental fate of honey bee queens is highly plastic, with queens raised from younger worker larvae exhibiting higher measures in several aspects of reproductive potential compared to queens raised from older worker larvae. Rangel et al. (2013) investigated the effects of queen reproductive potential ("quality") on the growth and Winter survival of newly established colonies. They did so by comparing the growth of colonies headed by "high-quality" queens (i.e., those raised from young worker larvae, which are more queen-like morphologically) to those headed by "low-quality" queens (i.e., those raised from older worker larvae, which are more worker-like morphologically). They confirmed that queens reared from young worker larvae were significantly larger in size than queens reared from old worker larvae. They also found a significant positive effect of queen grafting age on a colony's production of worker comb, drone comb, and stored food (honey and pollen), although they did not find a statistically significant difference in the production of worker and drone brood, worker population, and colony weight. Their results provide evidence that queen developmental plasticity influences several important measures of colony fitness. Thus, the study supports the idea that the honey bee colony can be viewed (at least in part) as the expanded phenotype of its queen."

"Failure of the queen is often identified as a leading cause of colony mortality. However, the factors that can contribute to "queen failure" are poorly defined and often misunderstood. Lee et al. (2019) studied one specific sign attributed to queen failure: poor brood pattern. In 2016 and 2017, they identified pairs of colonies with "good" and "poor" brood patterns in commercial beekeeping operations and used standard metrics to assess queen and colony health. They found no queen quality measures reliably associated with poor-brood colonies. In the second year, they exchanged queens between colony pairs (n = 21): a queen from a poor-brood colony was introduced into a good-brood colony and vice versa. They observed that brood patterns of queens originally from poor-brood colonies significantly improved after placement into a good-brood colony after 21 days, suggesting factors other than the queen contributed to brood pattern. Their study challenges the notion that brood pattern alone is sufficient to judge queen quality. Their results emphasize the challenges in determining the root source for problems related to the queen when assessing colony health."

"Queen reproductive potential (= quality) impacts the health and productivity of colonies. To determine the factors that affect reproductive quality during development, De Souza et al. (2019) tested queens produced under larval treatments by supplementing the diet with juvenile hormone (JH), additional sugars, or both, compared to untreated controls. Furthermore, they varied the age of the larvae that were grafted (one and three days old). They analyzed newly emerged virgin queens for their morphological characters as proxies for their reproductive potential. They found that the application of a sugar-enriched diet in combination with JH application onto 1st instar queen larvae produced higher-quality queens, while for 3rd instar larvae only the JH treatment resulted in increasing queen quality. For mated queens, those treated with JH plus supplemented sugars showed a significantly higher sperm count and sperm viability. Their findings demonstrate that honey bee queen reproductive potential can be increased through diet supplementation."

"The effect of capped queen cell incubation temperature on the quality of honey bee queens was examined. It was shown that the period of pre-imaginal development in queen bees from queen cells incubated at 32°C (89.6°F) was longer by one day and three hours when compared to those being incubated at 34.5°C (94.1°F), for which

this period amounted to 16 days and one hour. On the other hand, the quality of queens from cells incubated at 32°C and 34.5°C was similar, they did not differ in body weight, spermathecal volume, ovariole number in both ovaries, or onset of oviposition (Chuda-Mickiewicz and Samborski 2015)."

"Queen fertility and fecundity are vital to the success of a colony. Young mated queens are shipped worldwide to meet the demand of the beekeeping industry. Since little is known about the conditions experienced by queens in transit from breeders to beekeepers and the importance of these conditions on the queens' reproductive potential, Rousseau et al. (2020) conducted a two-part study. First, queen shipments from the USA and Canada to Canadian beekeepers were monitored to measure thermal conditions during shipment. A total of 39 shipments were followed in 2017 and 2018. Monitoring revealed variable temperatures during shipment, with occasional periods of lows (10-15°C) (53.6-59.0°F) and highs (30-36°C) (86.0-96.8°F). Second, young mated queens were placed in different shipping boxes with or without attendant bees and exposed to one of three temperatures (6°C, 26°C, and 40°C) (42.8°F, 78.8°F, 104°F) for two hours. They then compared the thermoregulation within shipping boxes, and the viability of sperm in each queen's spermatheca. Their results show that both low and high temperatures significantly decrease sperm viability, and that the addition of loose attendant bees within shipment boxes helps maintain the temperature at 26°C (78.8°F) when exposed to low temperature and delays the temperature increase when temperatures are high."

"Managed honey bee colonies face numerous health risks including nutritional stress, exposure to pests and pathogens, poor queen quality and pesticide contamination, which cause problems at the individual and colony levels. One of the most serious problems faced by honey bees is parasitization by the mite *Varroa destructor*, which is typically controlled through the application of miticides such as tau-fluvalinate, coumaphos and amitraz. In addition to miticides, colonies are also exposed to pesticides brought in by foragers from agricultural settings, including the fungicide chlorothalonil and the insecticide chlorpyrifos. Walsh et al. (2020) explored whether exposure of wax to combinations of these pesticides during development affects honey bee queen physiology and worker behavior. They reared queens in plastic cups coated with molten beeswax that was either pesticide-free or containing field-relevant concentrations of tau-fluvalinate, coumaphos, amitraz, or chlorothalonil and chlorpyrifos. Once queens mated naturally, they placed them in observation hives to measure egg-laying rate and worker retinue size. They then dissected the queens and used the contents of their mandibular glands to measure worker attractiveness in caged bioassays and to analyze their chemical components using GC-MS. Exposure of wax to field-relevant concentrations of the tested pesticides during queen development significantly lowered the adult queens' egg-laying rate and worker retinue size. Miticide exposure during development also lowered the attractiveness of queen mandibular gland contents to workers and affected the relative amounts of the glands' chemical components. Their results support the idea that mandibular gland pheromones act as honest indicators of queen reproductive fitness and that pesticide exposure of wax during bee development is an important and concerning factor impairing honey bee health."

"Residues of the organophosphate acaricide coumaphos and the neonicotinoid insecticide imidacloprid, widely used to combat *Varroa* mites and for crop protection in agriculture, respectively, have been detected in wax, pollen and comb samples. Chaimanee et al. (2016) assessed the effects of these compounds at different doses on the viability of sperm stored in the queens' spermatheca. Their results demonstrated that sub-lethal doses of imidacloprid (0.02 ppm) decreased sperm viability by 50%, seven days after treatment. Sperm viability was on a downward trend (about 33%) in queens treated with high doses of coumaphos (100 ppm), but there was not a significant difference. The expression of genes that are involved in development, immune responses and detoxification in honey bee queens and workers exposed to chemicals was measured by qPCR analysis. The data showed that expression levels of specific genes were triggered one day after treatment. The expression levels of P450 subfamily genes, *CYP306A1*, *CYP4G11* and *CYP6AS14* were decreased in queens treated with low doses of coumaphos (5 ppm) and imidacloprid (0.02 ppm). Moreover, these two compounds suppressed the expression of genes related to antioxidation, immunity and development in queens at day one. Up-regulation of antioxidants by these compounds in worker bees was observed at day one. Coumaphos also caused a repression of CYP306A1 and CYP4G11 in workers. Antioxidants appear to prevent chemical damage to honey bees. They also found that deformed wing virus replication increased in workers treated with imidacloprid. This research clearly demonstrated that chemical exposure can affect sperm viability in queen honey bees."

"Williams et al. (2015) also demonstrated that exposure to field realistic concentrations of neonicotinoid pesticides during development can severely affect queens. In pesticide-exposed queens, reproductive anatomy (ovaries) and physiology (spermathecal-stored sperm quality and quantity), rather than flight behavior, were compromised and likely corresponded to reduced queen success (alive and producing worker offspring)."

"The influence of various diets on the quality of honey bee queens was assessed. Colonies intended for queen cell production were assigned to four groups fed on (1) sugar-only, (2) mix of sugar, honey and fresh pollen, (3) sugar and pollen substitute (FeedBee®), and (4) natural sources. In addition, a fifth group had queen cells obtained naturally, by swarming. Sugar-only diet exerted a significant stimulating effect on the acceptance of queen cells and the weight of newly emerged queens, not affecting mated queens. Among mated queens those raised by bees fed on the mix of sugar, honey and fresh pollen had significantly larger numbers of ovarioles in comparison with all the others. Their weight was significantly higher than that of the queens from groups given FeedBee® and swarming queens. Compared to the latter, they had significantly wider spermatheca. Given the parameters monitored, FeedBee® proved not to be advantageous for queens (Dolasevic et al. 2020)."

"Slater et al. (2020) set out to determine the relative contributions of diet quantity and quality to queen development. Larvae were reared *in vitro* (in an artificial environment) on nine diets varying in the amount of royal

jelly and sugars, which were fed to larvae in eight different quantities. For the middle diet, an ad libitum quantity treatment (diet that allows food intake as much as desired) was included. Once adults eclosed (to emerge) the queenliness was determined using principal component analysis on seven morphological measurements. They found that larvae fed an ad libitum quantity of diet were indistinguishable from commercially reared queens, and that queenliness was independent of the proportion of protein and carbohydrate in the diet. Neither protein nor carbohydrate content had a significant influence on the first principle component 1 (PC1), which explained 64.4% of the difference between queens and workers. Instead, the total quantity of diet explained a significant amount of variation in PC1. These results indicate that total diet quantity fed to larvae may regulate the difference between queen and worker castes in honey bees."

"The honey bee queen is the central hub of a colony to produce eggs and release pheromones to maintain social cohesion. Among many environmental stresses, viruses are a major concern to compromise the queen's health and reproductive vigor. Viruses have evolved numerous strategies to infect queens either via vertical transmission from the queen's parents or horizontally through the worker and drones with which she is in contact during development, while mating, and in the reproductive period in the colony. Over 30 viruses have been discovered from honey bees but only a few studies exist on the pathogenicity and direct impact of viruses on the queen's phenotype (Amiri et al. 2020)."

"The number of female progeny that a queen produces in her lifetime is directly dependent on the amount of semen she collects upon mating (i.e., insemination volume) and the number of viable sperm cells contained within the semen (i.e., sperm viability). Queen insemination volume has been shown to alter queen mandibular pheromone profiles, as well as worker behavior and physiology at the individual level. In order to determine if queen insemination volume has any colony-level effects, Payne and Rangel (2018) compared the growth of newly established colonies headed by queens instrumentally inseminated with either a low volume (1.5 µl) or a high volume (9.0 µl) of pooled semen from May to October in 2013 and 2015. They did not find a significant effect of queen insemination volume on the production of worker comb, drone comb, stored food, worker population, or seasonal queen or colony survivorship. Therefore, they concluded that queen insemination volume does not seem to directly affect growth at the colony level, at least during a colony's first year." BC

References

Amiri, E., M.K. Strand, D.R. Tarpy and O. Rueppell 2020. *Honey bee queens and virus infections*. Viruses 12: 322 **doi:10.3390/v12030322**

Chaimanee, V., J.D. Evans, Y. Chen, C. Jackson, and J.S. Pettis 2016. *Sperm viability and gene expression in honey bee queens* (Apis mellifera) *following exposure to the neonicotinoid insecticide imidacloprid and the organophosphate acaracide coumaphos*. J. Insect Physiol. 89: 1-8.

Chuda-Mickiewicz, B. and J. Samborski 2015. *The quality of honey bee queens from queen cells incubated at different temperatures*. Acta Sci. Pol. Zootechnica 14: 25-32.

De Souza, D.A., M.H. Huang and D.R. Tarpy 2019. *Experimental improvement of honey bee* (Apis mellifera) queen quality through nutritional and hormonal supplementation. Apidologie 50: 14-27

Dolasevic, S., J. Stevanovic, N. Aleksic, U. Glavinic, N. Deletic, M. Mladenovic and Z. Stanimirovic 2020. *The effect of diet types on some quality characteristics of artificially reared* Apis mellifera *queens*. J. Apic. Res. 59: 115-123.

Hatjina, F., M. Bieńkowska, L. Charistos, R. Chlebo, C. Costa, M.M. Dražić, J. Filipi, A. Gregorc, E.N. Ivanova, N. Kezić, J. Kopernicky, P. Kryger, M. Lodesani, V. Lokar, M. Mladenovic, B. Panasiuk, P.P. Petrov, S. Rašic, M.I.S. Skerl, F. Vejsnaes and J. Wilde 2014. *A review of methods used in some European countries for assessing the quality of honey bee queens through their physical characters and the performance of their colonies*. J. Apic. Res. 53: 337-363.

Lee, K.V., M. Goblirsch, E. McDermott, D.R. Tarpy and M. Spivak 2019. *Is the brood pattern within a honey bee colony a reliable indicator of queen quality?* Insects 10,12; **doi:10.3390/insects10010012**

Payne, A.N. and J. Rangel 2018. *The effect of queen insemination volume on the growth of newly established honey bee* (Apis mellifera) *colonies*. Apidologie 49: 594-605.

Rangel, J., J.J. Keller and D.R. Tarpy 2013. *The effects of honey bee* (Apis mellifera *L.*) *queen reproductive potential on colony growth*. Insectes Soc. 60: 65-73.

Rousseau, A., E. Houle and P. Giovenazzo 2020. *Effect of shipping boxes, attendant bees, and temperature on honey bee queen sperm quality* (Apis mellifera). Apidologie 51: 724-735.

Slater, G.P., G.D. Yocum and J.H. Bousher 2020. *Diet quantity influences caste determination in honeybees* (Apis mellifera). Proc. R. Soc. B. 287: 20200614.

Walsh, E.M., S. Sweet, A. Knap, N. Ing and J. Rangel 2020. *Queen honey bee* (Apis mellifera) *pheromone and reproductive behavior are affected by pesticide exposure during development*. Behav. Ecol. Sociobiol. 74: 33

Williams, G.R., A. Troxler, G. Retschnig, K. Roth, O. Yañez, D. Shutler, P. Neumann and L. Gauthier 2015. Neonicotinoid pesticides severely affect honey bee queens. Sci. Rep. 5: 14621.

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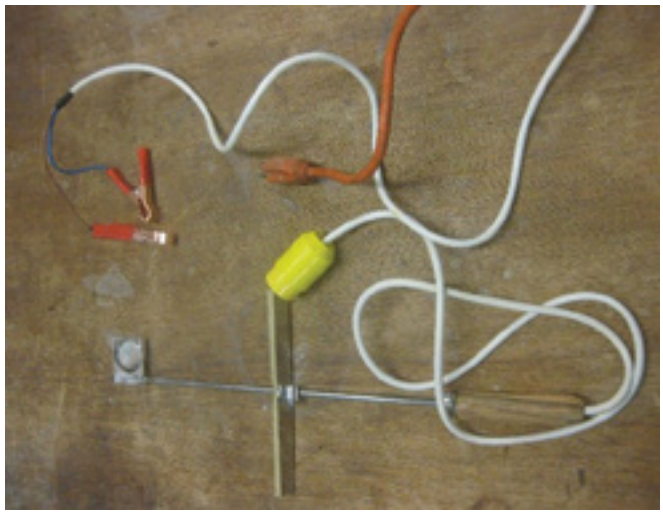
Number 1 Tip of the Month – OAV Extension

I was interested in the OAV treatment for mites but the idea of lugging a battery out to the apiary and maintaining a battery to be used maybe twice a year just seemed too much trouble. Then a friend gave me an OAV wand. Nice! The problem was that the wand only had an eight-foot cord. All my vehicles have 12-volt batteries but can't get within eight-foot of the hives. I still refused to maintain that extra battery and removing the battery from my truck each time I treated was still too much trouble.

My electrical experience lead me to the idea of using an extension cord. I just needed to cut the cable on the wand and install connectors. I placed the female connection to the wand end to prevent me or any borrower from plugging the wand into a 120 VAC outlet. I ran some tests to verify line loss would not be a problem, and it worked great. The crystals boil off in under two minutes with the extension I used.

If you do not have electrical experience, get help from someone who does before altering your wand. This sure beats the special battery requirement.

Greg Carey, St. Mary's County Maryland



Bee Culture wants you to share your good ideas with our readers. Be precise and include a photo or sketch if possible, but that may not be necessary. If we use your idea you get a free one-year subscription. The best each month gets $100.

The A.I. Root Pollinator Garden

Alyssum **Flowers**

The A.I. Root Co., and Bee Culture, The 'Magazine of American Beekeeping' will always be connected to the amazing history of Honey Bees and their Keepers. At our company headquarters we recently updated our pollinator friendly garden area in front of the offices along the main thoroughfare into our hometown of Medina, Ohio.

Over the next several months we will share with you how it is coming along and to highlight individual plants in the garden.

Gaillardia x grandiflora with seed heads.

Blanket flower, Firewheel or Indian blanket are common names of *Gaillardia spp.* which is a bright, cheerful perennial that should be added to any perennial, butterfly- or cottage garden. Its mounding habit with bright orange to red daisy-like flowers is a cheerful asset and magnet for butterflies and many bee species. Native to North America, it is heat and drought resistant and is usually not eaten by deer.

Several hybrids are available, the most common is *Gaillardia x grandiflora*, which is a cross between *Gaillardia pulchella* Foug (annual cultivar) and *G. aristate*, the perennial cultivar. You can choose from many cultivated varieties including 'Arizona 'Burgundy' (burgundy with yellow center) Arizona Apricot' (yellow disk and ray flowers); 'Arizona Red Shades' (deep orange to red flowers); Celebration (deep burgundy petals and center); and 'Oranges and Lemons' which is a pastel version with peach colored, yellow tipped petals and a gold center that reaches 2' tall. 'Fanfare' is more unusual with tubular shaped orange petals and a yellow center.

Gaillardia "Arizona Apricot."

Blanket flower was named because it covers the ground in bright earthy tones of orange, reds and deep yellow, which reminded early settlers of Indian blankets. The 3" diameter flowers arise from short, slender stems from mid-Summer through Fall and continually bloom until frost. The hairy gray-green leaves remain green all season and stay low to the ground. Depending on the cultivar, the average height of the plants including the flowers is 2-3' tall. They do best in loamy, rich soil in full to part sun but grow poorly in heavy clay soil. The plants are mostly free of diseases and insect pests.

Although it is Winter hardy through Zone 4, it often does not survive more than a few winters unless it is nurtured a little. Remove spent flower stems and divide in late Fall to stimulate new growth. Protecting it with mulch also helps.

Along with collecting and drying the seed heads, this plant can be propagated by dividing and taking shoot cuttings. Seeds of some cultivars need a chilling period before they can germinate. Check your particular cultivar for directions. Plant seeds in loose rich soil outside after all danger of frost or preplant four to six weeks indoors for earlier flowering.

Add this long time favorite to your garden for a fabulous display of color. Try several cultivars to add to the color wheel and enjoy the continuous traffic of butterflies and other pollinators to these showy flowers. Note that the goldfinches love the seedheads so you may want to leave a few for them! BC

References:

https://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=a579

https://gpnmag.com/article/gaillardia-unique-forcing-requirements-old-and-new-cultivars/

https://www.gardenia.net/plant-variety/gaillardia-blanket-flower

MAYAN AND MELIPONA BEE LOVE AFFAIR PART 2

Bel **Woodhouse**

Harvesting Melipona honey with a syringe.

Since the first natural log hive was brought near a Mayan house centuries ago, hive placement has been taken very seriously by Mayan beekeepers. Yes this is true of all beekeepers but to the Maya there are also spiritual and elemental components.

Like all beekeepers they believe if hives aren't placed in the most advantageous place within the natural world then optimum honey production will never occur.

This means blending with the entire natural world not just close proximity to key ingredients necessary for honey production. Like flowering trees or fresh water. After all, in the sub-tropics of Mexico's Yucatan Peninsula it is warm year-round so there is always flowering flora nearby.

From the highest treetop orchids and bromeliads blooming alongside flowering canopy vines and trees down to sprawling ground covers and expansive shrubs like lantana. There is always an abundance of flowers in the jungle.

These exotic flowers are responsible for the Melipona honey's unique taste. The only way I can describe it is to say that it tastes like the jungle itself. Not as sweet as commercially produced *Apis* species honey, it is darker and more potent with only a slight sweetness.

Because the Melipona produce about one thirtieth of European *Apis* species it is easy to see why the relationship is vastly different. The honey is precious. Used not so much as a food source, but as a cure-all within the culture. It is a gift.

This is the heart of the Mayan beekeeping practices. If respect is shown to the Melipona, and its deity the Royal Lady Bee, then hive yields will be good. Their deep-seated respect, admiration and affection for the Melipona ties into every aspect of their symbiotic relationship. They look after the Melipona and the Melipona looks after them in return by gifting them with longer life and healing through its honey.

The local Yucatan shaman I spoke with said "if the lady (the Melipona) is happy, she is generous and will cure anything you ask". This means everything from a stubbed toe or small cut through to healing a woman's caesarean scar after childbirth. Internally and externally, through both preventative and curative medicines, this potent jungle honey is used to help heal the Maya's mind body and soul.

Making a new hive.

Taking a little each day it's preventative measures boost the immune system, are used as an antidiabetic and anti-inflammatory. Which is also why it was mixed into high percentage dark cacao drinking chocolate in times past. Not as a sweetener but for health, strength and stamina. One cup was said to strengthen a warrior's body to cover great distances while providing enough energy to run all day.

Externally it is used on everything from curing cataracts with a watered-down drop to the eyes twice daily, as a treatment for skin spots, cuts and abrasions as well as mixed with herbs for beauty treatments. If you have ever seen the Mayan women you can see why, their skin is flawless.

To ensure optimal honey production environmental, elemental and spiritual factors all come into play.

Hive location in relation to direction aligned with cardinal points are as important as which protective gods are nearby. See, to the Maya, honey production encompasses the whole jungle as well as the deities contained within. Wanting the blessings and protection of the gods they also need to pacify the cheeky little jungle spirits, the Alux, which dwell alongside them. This in turn provides maximum protection for the bees so they can achieve optimal honey production.

Within a location each direction is believed to relate to the bees like this:
North – the place where bees go to collect pollen and resins.

East – the place where honey had its origin.

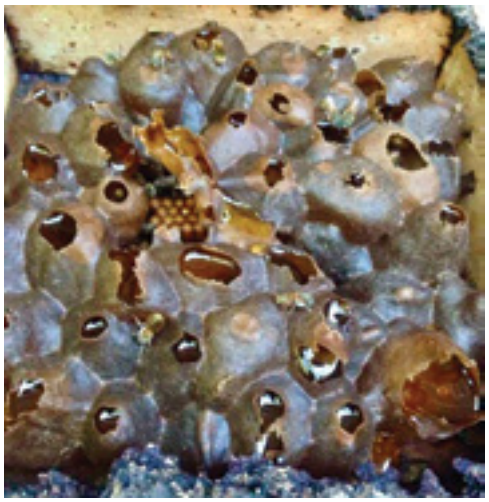
South – dedicated to the place where bees gathered to collect their pollen.

West – indicates the place where the young come from.

These old ways and beliefs stay the same as Mayan beekeeping has seen a resurgence in recent years. Partly as conservation efforts alongside the preservation of the Maya culture and practices.

The Melipona is a large and honored part of that culture. Which is why the only real change is manmade hives. Harvesting is much easier with a removable roof. As is division of colonies and the establishment of new hives.

A new hive is formed by placing a portion of an existing colony along



Melipona storage pots.

Different apiaries. The first is more of a traditional Maya apiary with palapa thatched roof. Below is more modern in a citrus orchard using the Melipona to fertilize their crops.

Inside a Melipona hive.

with a princess who quickly turns queen into a small manmade hive about the size of a shoe box.

Healthy hives double in size within a year. As the colony grows and needs more space, another section is added on top. Growing over the years to become multilayered hives. Because the Melipona's yield is so low, harvesting takes place once every 10 to 12 months.

The docile Melipona retreats when the hive is opened making honey harvesting easy. A large syringe simply extracts the honey from the fat globular open topped storage pots.

Great care is taken not to overharvest. The Maya believe that if you are greedy and tax the hive by taking too much, then the Melipona will leave. It is no longer a beneficial relationship working within the confines of the bee's biorhythms and natural lifecycles.

With this much respect, and an almost spiritual relationship the Maya and Melipona have they will continue to flourish just as it has in centuries past. A beautiful and amazing relationship between man and bee. BC

The Best Beekeeping Q&A (Almost)

Stephen **Bishop**

Occasionally, Jerry Hayes is sent questions that all other *Bee Culture* experts refuse to answer for liability reasons. These questions are collected and forwarded to the only beekeeping expert foolish enough to answer them, the lowly humor writer (whose assets, it should be known, hardly exceed the retainer of a good lawyer.)

What do you know about nude beekeeping?

Little. I only know one nude beekeeper, Ned. Ned was just a regular guy who wore clothes in public, especially in the bee yard. He never once thought about disrobing outdoors until he accidentally left his shirt tail out and bees (from a dropped frame) regrouped on his shoes and started marching (unbeknownst to Ned) up his pant legs. The bees formed two flanks along the belly and the back and coordinated a simultaneous assault. Underneath Ned's shirt tail and over his belt, the bees charged onto bare skin, where many sacrificed their lives on the rolling terrain of Ned's mid-section. Afterwards, Ned began running and shedding clothes simultaneously, leaving a trail of garments behind, including his whitey-tightys. This disrobing routine was captured and posted to YouTube by a random passerby and thereafter Ned became known locally as Nude Ned.

What is the best ladder to use for retrieving a swarm from an elevated position?

Every beekeeper needs a good flimsy ladder, one that bows and bends and bounces. A sturdy ladder is a big mistake. Nothing hurts worse than being walloped by a stout ladder seconds after you've plummeted back to earth. Nowadays it doesn't pay to add insult to injury. In the old days, some orthopedic surgeons offered two-for-one deals to beekeepers (for each shattered ankle, you got a cracked rib for free). But now, with the state of modern healthcare as it is, you can't count on free handling for secondary fractures, so it's best to be walloped by a flimsy ladder.

How does evil spread in a beeyard?

Sandspurs in your shoelaces. If you've never experienced sandspurs, picture yourself strolling through a blooming meadow beside your beeyard. Smell the flowers and feel the gentle breeze through your veil. Watch bees glide from flower to flower. Then, while listening to meadowlarks sing, take one more step and hear yourself utter, at the top of your lungs, your favorite exclamatory phrase. Hear it echo throughout the countryside. Then start hopping one-footed while calling for a medic.

My wife is threatening divorce if I ever use the kitchen again for extracting. What should I do?

Though some may suggest a dozen red roses, roses rarely work for threats of divorce. You will need a more dramatic romantic overture to smooth over the damage caused by a honey and wax-splattered kitchen. I suggest you offer a complete kitchen remodel. Though I don't know the specific dimensions of your kitchen, likely the Maxant Kitchen Remodel Package would fit your needs. Here's a blurb,

"For hobby beekeepers looking to take the next leap toward commercial production, the Maxant Kitchen Remodel Package offers all the equipment you need for an efficient honey harvest, without the need for a detached honey house. The package is easy to install in most kitchens. You merely 1) replace your stove with a Maxant motorized frame uncapper (future cooking can be done in the microwave) 2) replace the refrigerator with a Maxant 160-gallon bottling tank, the dimensions of which closely resemble those of a standard refrigerator (since honey never goes bad, refrigeration is not needed) 3) replace the kitchen island with new centerpiece of your extraction line, a new twenty frame Maxant extractor with a rugged ⅓ horsepower motor. (After honey harvest, the extractor can easily double as a spacious island)."

If your wife is unmoved by this goodwill gesture, I would suggest marriage counseling, ideally with a counselor who has beekeeping experience.

Is it hard being a beekeeping expert?

The hard part is perfecting a belly laugh. Laugh too hard at another beekeeper's mistake, and you'll be attacked with a dull hive tool. Yet show any hesitancy in your laugh, and people will doubt you're an expert. Thus, pointing out another beekeeper's problem and belly laughing afterwards, which is the major job responsibility of an all-around beekeeping expert, is like tight-rope walking with no net—meaning it's a very perilous activity that should only be attempted by trained professionals or those who pack up and leave town after a week.

If you have perplexing questions that need sage answers, Stephen Bishop provides free beekeeping and marital advice at misfitfarmer.com or you can contact him on ***Twitter @themisfitfarmer****.*

Newfoundland And Labrador
Still Free Of *Varroa*

The Newfoundland and Labrador Beekeeping Association (NLBKA) recently released a plan to deal with the arrival of a parasitic mite, *Varroa destructor*, that has devastated honey bees around the world. Newfoundland and Labrador (NL) remains one of the last places that remains free of the parasite.

A *Varroa* Action Plan for Newfoundland and Labrador (VAP) assesses the risk of a *Varroa* incursion by various pathways and concludes that illegal importation is the most serious biosecurity risk for the province's honey bee stock. The northeast Avalon Peninsula has the highest risk of a first incursion because of the Port of St. John's and St. John's International Airport, and because the region has the highest density of beekeepers in the province. Without an effective crisis action plan in place, the parasite would spread rapidly from its initial incursion point.

The VAP recommends a number of measures to prevent the arrival of the mite, and to deal with it quickly should an incursion take place. These include an ongoing "saturation advertising campaign" to educate beekeepers and the public about the dangers of *Varroa* and illegal importation, a volunteer sentinel apiary network with monitoring hives at strategic locations, a "passive" surveillance program whereby as many beekeepers as possible are trained to monitor for the parasite, testing of swarms and feral colonies, mandatory testing of bees sold around the province, "bee districts" whereby beekeepers test for *Varroa* before transporting bees across district boundaries, and enhanced government capacity to respond to a *Varroa* incursion.

"Getting *Varroa* would be a disaster for beekeepers and our industry," said Association president, Rodney Reid. "Unless we're well prepared for it, the parasite could wipe out 90% or more of our stock. The management of our bees would become much more complex and expensive in terms of time and money. It would discourage new beekeepers and possibly bankrupt our established and new commercial operators. These are some of the consequences we've seen elsewhere in the world."

Reid continued, "Our honey and other bee products are healthy, and relatively pesticide-free because our bees are not exposed to miticides. This allows us to compete successfully in the future in international niche markets for our apicultural products. However, this opportunity cannot be realized if the province loses its current 'freedom from *Varroa*' status."

"It takes only a single varroa mite to start an infestation. Without a good early detection strategy, we wouldn't likely notice it until it has spread far and wide around the province," said Reid. "It's like the COVID-19 virus. It spreads very easily with the help of us humans."

"Given its severe impact on honey bee health, beekeepers in this province should be well motivated to prevent *Varroa* incursions, implement the most sensitive early detection methods available, and also prepare for the arrival of the parasite so as to reduce honey bee colony losses to the greatest extent possible should it become established," said Reid.

Reid concluded, "the success of our efforts to stop *Varroa* will depend upon cooperation among a large number of our beekeepers in partnership with the provincial government. We're looking at a long-term commitment from all parties, coordinated action, and discipline. The sooner we get prepared the better! For a start, we are organizing free workshops immediately to train our beekeepers in how to monitor for and treat *Varroa*."

The *Varroa* training workshops are scheduled for St. John's, Port Blandford, Grand Falls- Windsor, and Cormack between October 3 and 11, with training provided by experienced beekeepers from New Brunswick where *Varroa* has been established since the early 1980s.

Beekeepers can register for the workshops in the area closest to them by contacting Peter Armitage, at **armitage_peter@bellaliant.net**. He will ensure that they are put on the list for the most convenient workshop and receive relevant details.

A copy of the VAP report can be obtained on the NLBKA's website –

The development of the VAP has been assisted by funds from the Canadian Agricultural Partnership – Newfoundland and Labrador.

For more information, contact Rodney Reid, President, Newfoundland and Labrador Beekeeping Association Email: **president@nlbeekeeping.com**; 709-290-5262 (leave a message if there is no initial response and Rodney will contact you ASAP. He is a very busy farmer!)

Backgrounder – key recommendations of the *Varroa* Action Plan report

The *Varroa destructor* mite causes significant honey bee colony losses throughout much of the world with associated economic costs and management challenges for beekeepers. The Newfoundland and Labrador (NL) honey bee stock is currently free of this parasite. In

A Varrroa destructor *mite climbing upwards ona toothpick.*
(David T. Peck photo)

addition to feeding on honey bees, it is also vectors and amplifies a number of viruses that are not currently found in the province's stock or wild bee populations.

Other jurisdictions such as New Zealand and Nova Scotia had *Varroa* for three to five years before they knew it. By the time the parasite was discovered in their stock, it was too late to eradicate; it was too widely distributed and established. NL can learn from the *Varroa* experience elsewhere, and adopt measures that prevent it from becoming established in the province. However, maintaining our *Varroa*-free status requires rigorous preventative and detection measures that have not yet been developed locally. The *Varroa* Action Plan (VAP) report presents a clear plan to respond to a *Varroa* incursion should it occur. Key features of the plan include:

- A "saturation advertising" approach to communicate the *Varroa* threat to the beekeeping community and the public at large;
- Measures to intercept *Varroa*-infested bees before they have contact with NL honey bee stock, e.g., monitoring social media for talk of illegal importation, Canada Post and courier companies monitoring for illegal imports;
- A volunteer, sentinel apiary program to facilitate monitoring of honey bee stocks across the province at strategic locations particularly at high risk locations such as locations with significant concentrations of beekeepers (e.g., northeast Avalon peninsula);
- A "passive surveillance" approach whereby commercial operators, small-scale, and hobby beekeepers are trained in *Varroa* monitoring and treatment methods, and encouraged to test for the parasite;
- Testing according to best practices recognized by the scientific community and governments internationally, namely, alcohol wash, sugar shake, and sticky board methods;
- Mandatory testing of any apiary from which bees are "sold" (nucs, queens, full colonies) prior to distribution;
- Creation of "Bee districts" with boundaries based on the distribution of apiaries and provincial geography, and taking into consideration the location of small fruit crop operations (namely cranberry), so that beekeepers can freely move colonies within districts without having to test constantly for *Varroa*. Transport of bees and used beekeeping equipment between districts would require testing for *Varroa* no more than 10 days prior to transport;
- Test swarms and feral colonies for *Varroa* prior to transporting them to another apiary;
- Conduct frequent and sensitive *Varroa* testing of swarm catcher home apiaries particularly if they are located near other apiaries, and they distribute bees to other apiaries (e.g., selling nucleus colonies, rent-a-hive arrangements, etc.). These apiaries are high risk potential *Varroa*-infestation locations;
- Enhanced provincial government support for honey bee biosecurity measures including regulatory reform to provide better bee health management tools, the allocation of resources for beekeeper education and training, and a commitment of resources to manage a *Varroa* incursion;
- A *Varroa* crisis management plan developed by the provincial government as soon as possible that details how it would respond to a *Varroa* incursion, identify the resources available for delimiting surveys and eradication, the funding available for stock replacement, and training for the provincial apiarist and other staff to undertake delimiting surveys (inspections) and eradication.
- Commence training of government emergency response personnel immediately. If resources are limited, alternatives should be considered including recruiting and training volunteer beekeepers in advance for *Varroa* inspection work;
- Limit *Varroa*'s devastation of NL honey bee stocks should it become established by training beekeepers in effective mite monitoring and treatment methods according to international best practices, and by establishing a mite resistance breeding program. BC

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Against The Grain:
Appreciation For Pollen

Christine **Bertz**

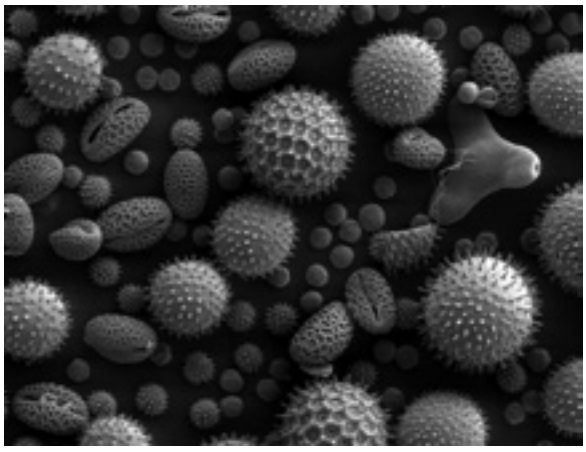
A grain of pollen is an amazing thing.

We don't usually regard pollen with awe. After all, on the surface, pollen's function appears mainly to be turning our cars yellow and our eyes red. People with a fondness for bees are more likely to appreciate pollen than most, since the honey bee relies on it almost exclusively as a source of protein. But pollen is even more complex than its role as a critical food source for our favorite insect suggests. A single grain of pollen is a self-contained, mobile manufacturing and shipping center, carrying all the materials necessary to fertilize a flower packaged compactly into an armor-plated, custom-designed vehicle.

In less fanciful terms, a grain of pollen is composed of two or three specialized reproductive cells inside a tough outer shell. (This coating is so strong that pollen is frequently preserved in the fossil record, particularly in lake sediments, and can provide valuable information about the climate in which its parent plant existed.) To produce a seed, pollen must travel from the male part of one flower to the female part of another, a journey that takes one of several forms: Some plants are wind- or water-pollinated, while others are carried by animals – including, of course, honey bees and other insects. Although not all grains of pollen reach their intended destination, they are constructed to optimize their chances of doing so. As a result, pollen from different plant species varies not just in color, but in size, shape, texture, and nutritional content, depending largely on how it is dispersed.

For example, wind-pollinated plants produce massive amounts of pollen that must be carried by air currents. To spread as far and widely as possible, pollen grains from these plants tend to be small and light – even by the standards of pollen, already microscopic in size. Some wind-pollinated plants produce pollen containing balloon-like pockets of air to increase their buoyancy, while others make pollen with wing-shaped outer shells to catch the wind like a kite. However, to remain lightweight, this type of pollen doesn't include many large, heavy molecules like proteins, so pollen grains from wind-pollinated plants are of little nutritional value to bees. Honey bees generally only deign to collect this type of pollen when other pickings are slim.

Insect-pollinated plants, by contrast, produce larger grains of pollen with a sticky or spiky outer shell. These pollen grains can easily cling to the tiny hairs on a pollinator's body to hitch a ride from flower to flower, and pack neatly for transport on the hind legs of honey bees. From a beekeeper's perspective, these larger grains of pollen are the first to be excluded during honey filtration, so mesh size is an important choice for beekeepers wishing to preserve the pollen content of their honey during processing. Pollen grains carried by insects are also relatively heavy, packed with nutritional content in the form of proteins, carbohydrates, lipids, minerals, and vitamins. Many insects are specialized to feed on pollen alone, so access to a variety of plants with pollen high in nutrient content is important for their health and survival. Honey bees are among these palynivores – but although we often say that honey bees are also herbivores, this may not be correct: As small as they are, pollen grains are colonized in turn by even smaller microorganisms – tiny fungi and bacteria that recent research has shown could be a critical component of a bee's diet.



The good news for pollinator stewards who also want an attractive yard is that insect-pollinated plants must advertise the presence of their nectar and pollen with beautiful flowers. However, not all flowers are nutritionally equal: In addition to differences in pollen composition from species to species, some cultivated varieties of plants are bred to be sterile, and may not produce pollen at all. Others, such as double-flowered plants, have been selected to produce blooms that are so ornate that bees can't reach the pollen within. Unfortunately, information on floral pollen quality can be difficult to unearth – but if a web search fails, then experts at a local nursery may have the right tools.

And expertise is certainly warranted. For such a tiny structure, pollen is enormously complex. It is a specialized vehicle for plant reproduction, traveling from place to place in many ways. Its variety impacts the health and foraging habits of pollinators. And it hosts its own diverse, mysterious microbiome, which we are only just beginning to explore. We can't always control the pollen sources in our vicinity as much as we'd like – especially during ragweed season – but we can choose pollen-producing plants for our yard that help supply honey bees and other pollinators with a diet that meets their nutritional needs. And since insect-pollinated plants are less likely to trigger our allergies, they make it a little bit easier to appreciate that the complexity of a grain of pollen is nothing to sneeze at. BC

BEE VET

Diagnostic Approach Part 3

Dr. Tracy **Farone**

In our big blue world, there are nearly 1500 different infectious diseases known to affect humans. 60% of these diseases are **zoonotic**, that is diseases that are transferred between animals and humans, and 75% of new and emerging infectious diseases are zoonotic (1). Officially, there are no zoonotic diseases in bees (with the rare exception noted in the literature of a few poor souls who decided to inject honey into themselves, which happened to be contaminated with *Paenebacillis larvae* or American Foulbrood, AFB, spores)(2). Every other domestic animal and many wild animals can transmit disease to us, so the lack of zoonotic disease in bees is quite unique. This lack of natural, direct, zoonotic disease transmission between bees and humans allow beekeepers to enjoy a more relaxed, low-risk interaction with our bees regarding disease.

However, our bee's health and the drugs we use to treat them affects us all - humans, other animals, and our environment. The concept of human, animal and environmental health being inevitably intertwined is called "**One-Health**". Our bees' good health is vital to provide pollination services for a large portion of our food supply. The drugs and chemicals we utilize to treat bee diseases can leave residues and contaminate bee products, like honey and wax. **Antibiotic resistance** is considered by national and global health organizations to be a top priority public health crisis in the world. 700,000 human deaths are attributed to antibiotic resistance *every year* (3,4) Overuse or misuse of medications can lead to treatment resistance to the particular disease within our patient, our colonies. One should always consider the overall effects of developing treatment plans and administering drugs, medications, pesticides, home remedies – all chemicals, to your bees. Below is some guidance on how veterinarians can help beekeepers employ treatment plans.

The Development of Treatment Plans

Ideally, to have the best outcome for any patient and to avoid drug resistance, it is best to have a proven diagnosis before treating any disease. As a young veterinary student, I can remember being eager to learn about how to treat diseases – how to fix it! I would sit in lecture halls for weeks on end learning about various pathological disorders . . . how they look, how they develop, even how they smell, but every time, near the last lecture of the term, when treatment would finally come up for discussion, the same old phrase would appear, "Treatment: Depends on the Diagnosis". Everyone wants a magic pill to fix all our issues, but it is hard to fix what you have not identified. Veterinarians *are* permitted to start treatments immediately (pending confirmatory testing) based on a tentative diagnosis, if they find it appropriate, such as in case of suspected AFB.

Define Drug Resistance

Over the years, I have found that there is some confusion about the nature of **drug resistance**. So, let us take a moment to step back and define drug resistance. Antibiotic resistance is a specific example of drug resistance, but resistance can occur with any chemical that is used to treat an infectious agent or pest. For example, there is concern about resistance development with miticides used in the treatment of varroa mites. Drug resistance means that a given population of bacteria, varroa mites, or whatever, have been exposed to a certain drug. The drug kills most of the pathogens, but a few may survive. These lucky few have a genetic predisposition that allows them to survive and go on to create the next generation of bugs. This new generation of drug resistant organisms emerge, and our drugs become less useful. Drug resistance is **not** the patient "getting used to the drug". Now that that's cleared up – A careful review of any medications previously used in your beeyard/s could inform best practice choices for your bees going forward.

Don't be afraid to reach out for help! (Deidra Ressler photo)

Employment of IPM Practices

Integrated pest management is a practice commonly employed by beekeepers and veterinarians alike. Most diseases of animals, including bees, are not treated with drugs alone or proper treatment can be achieved without drug intervention at all. Engaging in best management practices, re-queening, proper nutrition, and sometimes just plain rest are often the best medicine.

Drugs are only one tool in our toolbox for fighting disease. In fact, of the few bee drugs that

require veterinary intervention, their effectiveness is only in part to nearly useless. Since antibiotics are not effective against AFB spores, burning is required or highly recommended for hives infected with AFB, and for *Melissococcus plutonius*, European Foulbrood (EFB), treatment with antibiotics is typically only used in severe cases and in conjunction with other IPM practices.

Good News: Most backyard beekeepers employing good biosecurity protocols should not have to use antibiotics because typically their bees are kept in one area (reducing stress and exposures). Also, luckily, AFB is a great example of an **endemic** disease. What is an endemic disease? Endemic disease is a disease that is ever present in a geographical area but typically in low, manageable levels. Due to the long surviving spores that AFB produces soil is contaminated. While data of AFB incidence can be difficult to obtain due to the stigma of this deadly disease, known prevalence data year to year only affects a small fraction of colonies. The literature supports that it is likely that many healthy hives exposed to AFB spores can manage the infection sub-clinically and remain asymptomatic.

Developing a treatment plan for Varroa *mites is of primary importance.* (Deidre Ressler photo)

Provision of VFDs and Prescriptions for Antibiotics

Since 2017, the FDA has required a veterinary feed directive (VFD) or prescription from a veterinarian to administer medically important antibiotics to bees. The formulary is simple and limited. There are three approved drugs for use in bees, Oxytetracycline, Tylosin, and Lincomycin, available in 11 different approved veterinary preparations. Only one drug, oxytetracycline, is approved for the treatment of *Melissococcus plutonius* (EFB) in either a VFD or prescription. For AFB, only oxytetracycline is approved in both VFD and prescription forms. Tylosin and Lincomycin can be used for AFB only by prescription.

Not every vet will agree to see bees. To better serve their clients, many veterinarians self-limit themselves to the species of animals they serve, because the scope of what we may cover is so vast. This is not uncommon and not intended to be exclusive. You would not call a cat clinic to see your goat, right? But how do you find a vet for bees? Here are a few suggestions. If you already have a local vet for your dog or horse or whatever, it does not hurt to ask if they are willing and able to see bees. The Honey Bee Veterinary Consortium (HBVC) **https://www.hbvc.org** has lists of vets by state that are willing to see bees. Your state's Department of Agriculture (DA) has state veterinarians who may have contact lists of vets willing to see bees. For example, in PA, I consult regularly with the PADA on bees and compiled a list of vets interested in seeing bees.

Proper Use and Withdraw Times

I cannot stress enough the importance of proper use of medication. Labels and indications for use must be followed. It is the law, but also good practice in providing the safest course of treatment for your bees, preventing drug resistance, and preventing residues in bee products. Many drugs, like antibiotics and miticides, cannot be used when honey supers are on or must be withdrawn four to six weeks before honey supers are added. This requires careful management planning and record keeping to achieve. For antibiotics, approved indications of these drugs can be used for prevention, control, and/or treatment of disease. This is of primary importance in the management of foulbrood in migratory and/or commercial operations.

Holistic Health Practices: Beyond Antibiotics and Foulbrood

While AFB and EFB certainly can be serious disease issues, their prevalence and overall impact pales in comparison to nearly every hive in the U.S. and much of the world being threatened by the panzootic (pandemic), varroosis. Good health requires evaluation of the whole patient. Would you only see your doctor for two diseases and treatment with three drugs? Thankfully, most backyard beekeepers may never have to deal with foulbrood, but many backyard beekeepers could use more help understanding how to manage the overall health of their bees and maintain strong colonies.

Certainly, state apiarists, university entomologists, seasoned beekeepers, and various beekeeping organizations offer many great resources for beekeeping. These groups and general beekeepers alike are still looking for more support to cover the demand for good information and services. Here's where bee savvy vets can add their abilities to partner with the industry.

I think the stage is set-up for some complimentary relationship building. Veterinarians that limit themselves to small, companion animals would be well acquainted to the nature of the relationship backyard beekeepers have with their bees. Large animal veterinarians would be well up on the curve with working with commercial beekeeping farmers. Within the profession there are also research and lab animal vets that can fit in quite well with entomologists.

Continuing education on bee health is included in nearly every major veterinary conference in the last four years and veterinary schools across the U.S. and Canada are adding bee curriculum. Currently, I am working with a group developing a veterinary textbook series on bee health and I am writing the chapter review on registered drugs used in the U.S. and Canada for honey bees. This review will include not just antibiotics but other medications for use in bees for a variety of medical conditions.

The Best Treatment: Prevention

As I end this three-part series, I hope it gave you some insight into how veterinarians are trained to approach disease and help achieve health in our patients. And with the end, we are back to the beginning – the best treatment is prevention. Prioritizing the four key elements of good husbandry/understanding bee biology, *Varroa* and other disease control, nutrition, queen status/genetics will go a long way in keeping the healthiest honey bees. BC

References and resources for further reading:

1) Zoonotic disease prevalence: **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5711306/#:~:text=Emerging%20and%20endemic%20zoonotic%20diseases,origin%20(1%2C2)**.

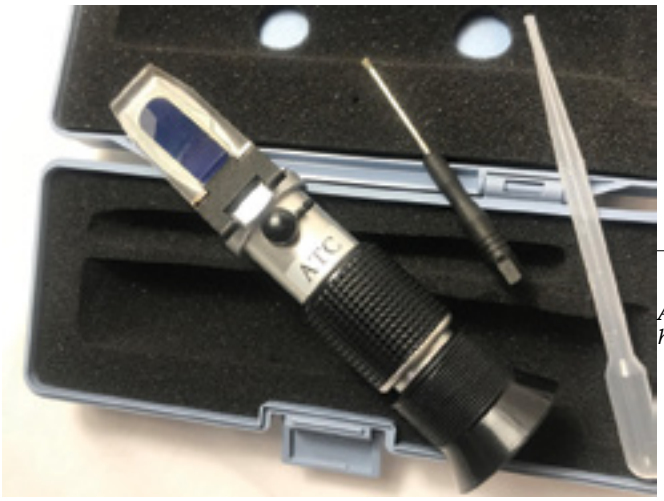
2) Human cases of *P. larvae* bacteremia: **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3322038/**

3) CDC information on antibiotic resistance: **https://www.cdc.gov/drugresistance/solutions-initiative/stories/ar-global-threat.html**

4) WHO information on antibiotic resistance: **https://www.who.int/news/item/29-04-2019-new-report-calls-for-urgent-action-to-avert-antimicrobial-resistance-crisis#:~:text=By%202030%2C%20antimicrobial%20resistance%20could,die%20from%20multidrug%2Dresistant%20tuberculosis**.

Veterinary approved bee antibiotics: **http://www.farad.org/vetgram/honeybees.asp**

Great resource for best practices and management of varroa and other diseases: **https://honeybeehealthcoalition.org/**



An analogue honey refractometer.

REFRACTOMETER

All You Need To Know

Hanna **Bäckmo**

Honey typically contains somewhere between 14% – 20% water, seldom less, sometimes more. Honey contains lots of other substances as well, such as carbohydrates, mineral substances, enzymes, organic acids, proteins, and vitamins, but it is the water that we are going to concern ourselves with in this article. The water found in honey is mostly residual moisture after the process of nectar ripening. I say mostly, because as honey is hygroscopic, it absorbs moisture from its surrounds. If honey is stored incorrectly after extraction, its water content can increase. Frames of uncapped honey stored incorrectly prior to extraction can also absorb moisture and thus increase the water content of the honey. The percentage of water in honey depends on nectar origin, honey maturity and environmental factors such as climate, weather, and storage.

The water content of honey largely determines if the honey can stay fresh. The lower the water content, the better the honey will keep. As a beekeeper, being able to produce honey with the 'right' moisture content is imperative, particularly if you intend to sell your honey or store it. Honey with low moisture content will crystallize, or granulate, rapidly, but other than that it rarely gives any trouble. Where things go wrong is when honey with high moisture content is harvested and subsequently stored incorrectly, as this can lead to fermentation of the honey. This would render it unsuitable for resale as anything other than baker's honey.

Fermentation

In order for fermentation to occur, three components need to be present. Yeasts, relatively high moisture content (in excess of 17%), and a suitable temperature for the yeasts to grow (10-30°C approximately). Take away at least one of these components and the honey will not ferment. For instance, store the honey below 10°C and/or ensure that the moisture content is low. You can kill the yeasts by heating the honey also, but this is not recommended as the heating process will destroy or reduce the effect of the enzymes present in honey, as well as altering the flavour. Yeasts are brought into the hive with the nectar. Many yeasts will die when the nectar is dried out and the sugar concentration rises. However, some remain in the honey. You will find the greatest amount of yeasts in uncapped or unripe honey, and it also contains more water than its capped or ripe counterpart. Yeast needs nitrogen and mineral salts to grow, which is why some honey which contains a lot of those substances will ferment faster.

There is no universally accepted number for what moisture content honey should have, but a good guide to aim for is somewhere between 16-18%. Below 17% moisture content, no fermentation will occur. At 18% no fermentation will occur unless there are large amounts of yeasts present. Above 19% moisture there is a definite danger of fermentation regardless of the amount of yeasts present. At 20% and over, yeasts will multiply freely, and the higher the moisture content, the more rapid the fermentation becomes.

This presents the need for the beekeeper to be able to accurately measure the moisture content in honey. In the apiary, we may do a simple shake-test to see if the honey is ripe enough to be harvested, (give frames of uncapped honey a good shake, if the honey comes out, it is not ready, and if it stays in the comb, it can be harvested and extracted alongside the capped frames). But when it comes to bottling and storing the honey, we need to be a bit more scientific than that.

Measuring moisture content in honey

When light passes through a substance, it changes direction. This is called refraction. The amount of refraction that the light undergoes depends on the amount or concentration of solids in the solution. A refractometer is an instrument that measures the refractive index of a substance, or, in layman's terms, the degree that light, passing through a solution, is bent. By measuring the difference between the angle of the light coming in (incidence) and the angle of the light going out (refraction) of a substance you have the components needed to calculate the refractive index. If you look at a glass of water with a straw in it, you will notice that the straw looks as if it is bent or distorted. This is because the light passes through the glass more quickly than it does through the glass and water. Similarly, light will pass through honey with fewer solids faster than it will through honey with many solids. Hence, the refractive index of honey will change relative to the amount of sugars, pollen, and other substances present in the honey.

The refractometer is a very useful tool that measures the refractive index, does the calculations, and presents a reading. Refractometers are used not only by beekeep-

ers. Different types of refractometers are used in other professions and industries such as medicine, brewing, machine- and car industries, gemology, and are used to measure salinity in aquariums, etc. The amount of solids in a solution is measured on a Brix scale, where each degree of Brix (°Bx) equals one percent solids (There are other scales also, but the Brix scale is used when measuring sugars). So, on a refractometer using the regular Brix scale, 20 degrees Brix means that the solution contains 20 percent solids. Anyone familiar with honey refractometers will be aware that they do not present the readings as solids in water, they work the opposite way and give measurements for water in solids. The scale works in reverse, and what we see is the water content of a solution as opposed to solid content. They are not designed this way to confuse, but to make the process of measuring moisture content in honey more straight forward for beekeepers, and more exact. The honey refractometer also does not commonly have the full 0-100 Brix scale, but typically displays values between 10-30 (% water) or 70-90 (% solids). Both a regular refractometer and a honey refractometer can be used to measure moisture content in honey, the only difference is how the results are read.

The refractive index will change slightly as the temperature changes so most refractometers are designed to make corrections based on temperature using Automatic Temperature Compensation, or ATC.

Different refractometers

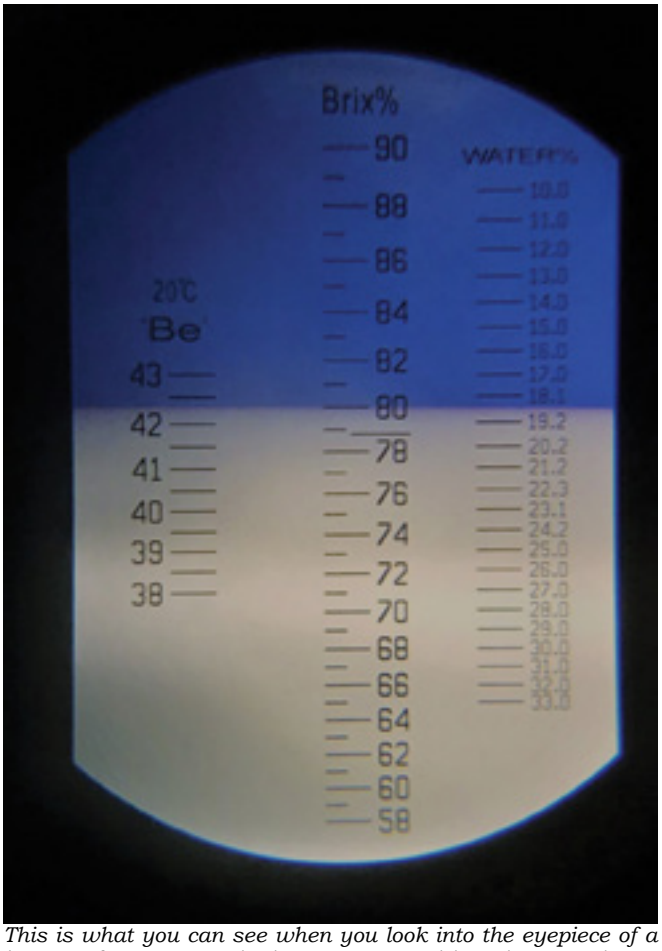
If you are considering getting a refractometer to measure your honey, it is advisable to get a honey refractometer as opposed to a regular one. There are many honey refractometers available on the market, most are portable and easy to use. There are both analogue and digital instruments available, ranging in price from around 20 Euros or about $25US to several hundred and even thousands for laboratory style pieces. You can of course fork out for a top of the range digital version, but a standard analogue honey refractometer will give adequate readings. The readings will not be completely accurate but typically within one degree Brix, or 1 percent, fault margin, so will give a good indication of the moisture content in your honey, provided that the refractometer is used correctly and is calibrated properly.

Calibration

The first thing that you have to do with your refractometer is to calibrate it. By calibrating it, you are using a reference liquid or solution that you know the Brix reading of (or the moisture content) and adjust the instrument so that you get the same reading on its Brix scale. Some refractometers are already calibrated, but it is always good to re-calibrate it yourself first before using it to test your honey. The screw used to adjust the reading could have become loose in transport, and it is good practice to recalibrate your instrument after it has been unused for any length of time.

Reference solution

When calibrating the refractometer, you need to make sure that you use a reference solution that is suitable for your particular instrument. For instance, if you are using a honey refractometer with a reduced Brix scale, such as 90-60 Brix (or 10-30% water) which is common for honey refractometers, you may have problems calibrating it accurately if your reference solution falls outside of those measurements. Many of the cheaper refractometers do not include any reference solution, and unfortunately many also come with the wrong instructions. It does not necessarily mean that there is anything wrong with the instrument itself, only that you have to do a bit more work to get it right. If you do not have a reference solution supplied with your instrument, it is possible to use oils that you have in your kitchen to calibrate your refractometer. For instance, extra virgin olive oil can be used, as can liquid paraffin. Extra virgin olive oil measures 71-72 Brix. If using this oil to calibrate, set it at 71.5 Brix (or 27% water). Liquid paraffin has a moisture content of 24.5%. If you are unsure of the moisture content or Brix reading of a substance, there is little point in attempting to use it as a reference solution. If, however, you are stuck and you happen to have access to someone who has a refractometer that is properly calibrated, you can use this instrument to determine the Brix of a substance, and then calibrate your own refractometer accordingly. This is obviously a cumbersome way to go about it, so it is easier just to ask them for a few drops of their reference solution if it falls within the Brix scale on your refractometer. It is always good to have a small bottle of reference solution stashed alongside the refractometer in your honey room. Write down the Brix or the moisture content on the bottle so



This is what you can see when you look into the eyepiece of a honey refractometer. The honey measured here has a moisture content of approximately 18.5%

that you do not have to rely on your memory, look it up or make guesstimations the next time you need to recalibrate.

This is how to calibrate an analogue refractometer (for digital versions, follow the instructions provided with the instrument):

- Lift the clear panel that sits on top of the glass and clean the glass or prism with a lint free cloth. Then add a couple of drops of the reference solution to the glass and spread it out. Make sure there are no air bubbles in the reference solution and close the panel. Any air can be squeezed out by gently pressing down the panel and wiggle it slightly.
- Remove the cover for the calibration adjustment piece and have the little screwdriver at the ready.
- Hold the refractometer towards a bright light and look through the eyepiece. Focus the eyepiece if necessary, to make the lines and numbers clearer. You should see a field of blue and another field of white, with a very distinct line where the two fields meet. This line marks the Brix of the substance measured.
- While still looking through the eyepiece, insert the screwdriver into the screw in the adjustment piece and turn it until the line correlates to the number for the known Brix reading of your chosen substance.
- Your instrument is now calibrated and ready to use. Replace the cover for the calibration adjustment piece and clean the clear panel and prism using a damp soft lint free cloth.

Refractometers need to be recalibrated regularly, at least every season but preferably more often as the instrument is sensitive. The adjustment screw can accidentally loosen during handling causing the reading to change, and it is also somewhat sensitive to changes in temperature.

How to use an analogue refractometer

Once properly calibrated, refractometers are delightfully easy to use. Make sure the honey is well stirred (honey that has been sitting in a bucket or jar for some time will often have different readings in the samples taken from the top and bottom) and that the honey is the same temperature as the refractometer, ideally room temperature.

- Lift the clear panel that sits on top of the glass and clean the glass or prism with a lint free cloth. Then add a couple of drops of honey to the glass and spread it out. Make sure there are no air bubbles in the honey and close the panel. Any air can be squeezed out by gently pressing down the panel and wiggle it slightly. Make sure not to put too much honey on the prism as it can make it difficult to get a clear reading.
- Hold the refractometer towards a bright light and look through the eyepiece. Focus the eyepiece if necessary. You should see a field of blue and another field of white, with a very distinct line or border where the two fields meet. In most analogue refractometers there is an ascending Brix scale in the middle, and a descending water content scale on the right. The line will go through both scales and thus you can read both the Brix and the water content in percent in the same reading.
- Clean the clear panel and prism using a moistened soft lint free cloth and repeat.
- Take multiple readings and calculate the average, especially if measuring the moisture content of a bucket or large amount of honey.
- If the honey is to be stored, write down the moisture content of the honey on the bucket alongside the batch number and extraction date.
- When finished, clean the refractometer, and put away in its box. Be careful with the prism as any scratches can impair or interfere with the readings.

In order to ensure that the honey does not contain excessive moisture, when harvesting make sure that the honey in the frames is ripe and take frames with capped honey only. It is nearly impossible to completely exclude uncapped honey when harvesting and extracting, particularly at the end of Summer harvest, and many beekeepers will include up to 10 percent of uncapped cells. Take off the honey supers in the morning so that the bees can dry out the honey over-night and to ensure that there is no new nectar coming in. If there are a lot of uncapped frames to be harvested and extracted, they can be dried out prior to extraction using a fan and/or dehumidifier. The honey can also be extracted and stored separately. Honey with high moisture content for own use is best frozen in jars and taken out as they are needed. Extracted honey with high moisture content can be placed on trays and dried using a fan and/or dehumidifier. Smaller amounts can also be mixed in with honey with low moisture content. If doing this, ensure that the end result is a honey that has no higher than 17-18% moisture content.

Finally, I would advise anyone who harvests honey to use a refractometer to measure the moisture content of the honey, whether it is for own consumption, gifts, or sale. BC

For any comments, feedback, or suggestions, please email **Hannabackmo@yahoo.se**

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Indoor Beehive Wintering Operations

John **Miller**

Happy New Year Fellow Travelers!

Indoor Beehive Wintering Facilities nationwide are now in full swing, shipping beehives to California for almond pollination season. It is 2500 semi loads of bees passing through almost exclusively one 'Bug Station', in Truckee, CA. To address the frequent congestion in Truckee, a Memorandum of Understanding is now in place between California, Idaho, and North Dakota. Montana will probably soon also join the MOU. Under the terms of the **Apiary Pre-Inspection Certificate**, participant beekeepers may pass through Truckee without delay. Truckers like the program. Truckee officers like it. More beekeepers join every year.

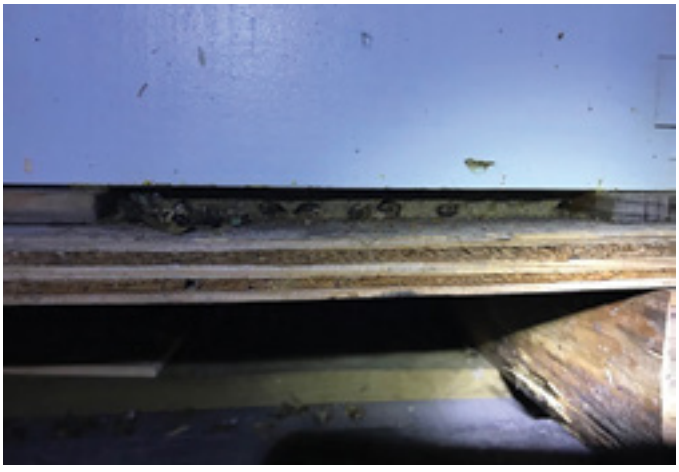
I care for a building housing Miller Honey Farms, Inc. beehives. This year we stored nearly 15,000 hives. The building we use is designed to handle up to 22,000 hives; 120' X 150' w/ popouts housing refrigeration equipment. We put up the building in 2015/16.

Dead bees – about a tote a week.

I observe conditions in the building most days. Here are a few things I've learned. As time goes by – the buildings are going to get smarter – and the owner/operators will too.

1. Beehives stored indoors shed dead bees all Winter. Prepare for it. 300 gallon totes are fine for storing the dead bees. Dead bees sweep up easy. A seasoned floor squeegee with wings is good. Soft-bristled brooms are fine too. Large areas of the building are open – the entire middle of the building, is open for trucks to pass through. A 4' broom will get that area clean in a hurry. Stacks are, in our building **supposed** to have 25" clearance. Perfect width for a 2' broom or squeegee to sweep those bees to row ends. Stacks 23" apart are an annoyance, the broom clunks the pallets on both sides. Soon – several dozens of compound eyes investigate the disturbance. The red-light headlight banded to your forehead becomes a beacon for incoming. Avoid this.
2. Those garden shoes you almost threw away in September have one final calling. As careful as I am to keep a broom or squeegee in front of me at all times, literally at all times; in spite of this: Shoes get dirty, they stink; you might be bodily thrown from your own house upon entering with 'bee building' shoes on. I'm not afraid to defend the clean building if visitors/inspectors come. "You're welcome inside; as long as this broom stays in front of you at all times."
3. Marvels in the building. This particular hive is well-prepared for Giant Hornets. Actually, the entire building is Giant Hornet proof. See the amount of propolis covering the entrance? I looked at the hive for other entrances – the hive bodies are tight; and shown is **the** entrance for this hive. This is a breathing, living super organism reliant on oxygen to survive – yet the entrance is so propilized – it's easy to imagine the

Old shoes – last life.

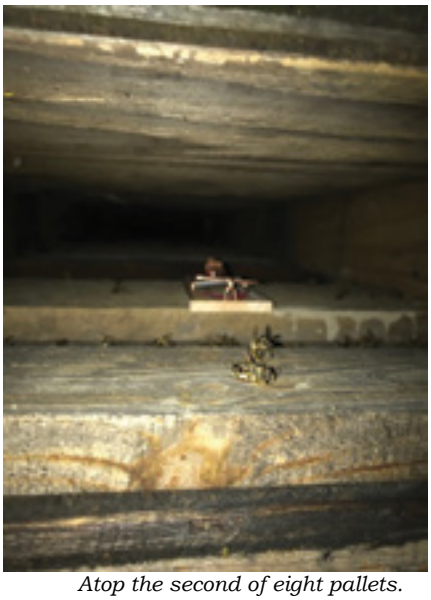


We are looking eye-level at the entrance. The white surface is the hive body. The plywood is the pallet bottom board. Visible are barely bee size holes in the propolis entrance-caulking.

C02 levels within that hive would be interesting to monitor.

4. Every concrete expansion joint is an opportunity to set a mouse trap. Consider, in the Fall mice like to move into beehives. Now, say there is one mouse per 16 hives; four pallets loaded into the building. [I'll do the arithmetic for Orland beekeepers.] Loading 4,000 pallets = 1,000 mice happily hauled in while loading. This was my estimate in December, 2019. I had placed about 100 mouse traps in the building. I was trapping about 20 mice a day during December – in January the number dropped. So every concrete seam is the location of a mouse trap on the floor, and atop the 2nd pallet of the eight pallet stack. Groping your way around in a pitch-black building with a forehead light is confusing. Use the seams to locate devices placed in the building.
5. Data matters. This stack of 12 beehives sets on a platform scale. I have enough data to confirm: bees properly stored indoors use less feed than previously thought. In our building, bees eat about 1/8 of a pound daily. Knowing this, a beekeeper using indoor wintering could verify weights in September and store their bees to best meet feed costs/needs. With discipline, beekeepers could reduce freight costs. On December 20, 2020 the scale hives weighed 1385 pounds. 12 beehives aboard. Today the stack averaged 115.4 pounds per beehive. A semi can haul 80,000#. Tare it at 32,000# - 48,000# / 115# = 416 hives. Trim average hive weight 10 pounds; to 95# / hive; the semi now hauls 488 hives. 488 > 416.
6. Try stuff. Pictured is a grain vacuum. Yup, it's a drum with a twin blower vacuum with a really long hose. I bought it. It didn't cost $60,000 for a whole-building vacuum system. The grain vacuum works great – except the drum must be lifted/hoisted to dump. You will leave a pile of dead bees in the drum once. Once only. If I use the vacuum, I empty it before leaving.

At every seam.



Atop the second of eight pallets.

Always. Indoor wintering buildings will be much better in 10 years. Building designs will improve. Better software emerges [we re-wrote our software OS]. Beekeepers do more 'backgrounding' of hives in Q3 – improving survival and efficiency. BC

Grain vacuum.

Colonies in stack on scale.

Weight of colonies in the stack.

Minding Your Bees And Cues

Meal Planning – Hungry Bees

Becky **Masterman &** Bridget **Mendel**

What if you were solely responsible for the nutritional needs of your honey bees? With most livestock or pets, feeding them daily is a big part of your job as caretaker. Honey bees on the other hand can be established and simply let loose on the landscape. Your bees fly for miles, over property lines, to locate flowers. They recruit their sisters to floral patches, and hopefully gather copious amounts of nectar and pollen. Food wise, bees can be economical pets, that is until you have hungry bees. Then what? Nutrition is an essential baseline for healthy bees, allowing them to thrive and better resist disease pressures.

Whether you think of your honey bees as pets, livestock, or the tears of an ancient god: what are you doing to ensure that they are well-fed? Generally, conversations about feeding bees focus on pollen substitute, syrups, sugar cakes and fondant. We all worry about feeding our bees in early Spring or in preparation for Winter, but not all beekeepers worry about ensuring their bees have access to diverse flowers. What if we spent more time planning for the flowers our bees will need? What if beekeepers actively managed their bees' health not only inside the colony but outside the colony as well, through land management and community engagement?

Some beekeepers can plant bee food plots right on their property, thereby supporting at least some of their bees' floral needs. Of course, it is impossible for each beekeeper to plant enough flowers to feed all of their colonies. Instead, feeding our honey bees must become a group effort. Exploring ways to engage others to feed our bees will also support our neighbor's bees, and offset the calories honey bees might otherwise take from native bee flowers in the area. Furthermore, planting for bees as a central beekeeping practice might change how we view beekeeping, underlining the primacy of good nutrition for bee health, as well as the complex obligation we as beekeepers have to other bee species.

In December 2020, the outgoing chairman of the House Agriculture Committee, Rep. Collin Peterson, D-Minn., proposed a bill that would require the Secretary of Agriculture to enroll 50 million acres in the Conservation Reserve Program (CRP) within five years. While the current limit is 50 million acres, only 22 million acres are enrolled. While not expecting the bill to pass, Representative Peterson hoped to highlight the carbon sequestration role that CRP provides. Importantly to beekeepers, the CRP program already includes the option to provide pollinator habitat with its CP42 initiative (see link to article by Randall Cass below).

It was Minnesota farmer Keith Johnson who brought Representative Peterson's CRP bill to our attention. Farmer Keith was concerned that the proposed bill was being debated within agricultural groups, but not among other stakeholders, like beekeepers and pollinator advocates. Concerns about both CP42 seed mix design and pricing need to be addressed through beekeeper input. If we understand the intricacies of the legislative programs and proposals our taxes fund, our voices and votes can be used to improve and support those initiatives that will best help us feed our bees.

We look to beekeeping clubs for mentorship and fellowship. Can these groups also foster an engaged beekeeper community that understands the issues and opportunities around bee habitat? The Minnesota Honey Producers Association* took an important first step to address the habitat (and honey) crisis at their December board meeting. They voted unanimously to form a Habitat Committee.

If your organization doesn't have a habitat committee yet, we

While we can't plant enough flowers for the bees in every apiary location, it doesn't hurt to try! Goldenrod is a great late season source of bee food. (Bridget Mendel photo)

challenge you to start one. Addressing the habitat issue within a club is efficient. Beekeeping organizations can connect with local growers, habitat experts, legislators and programs to learn about the issues and barriers to putting more flowers into the ground. Instead of reacting to opportunities and political initiatives, a committee can provide information and guidance to members who are invested in increasing the number of bee flowers in our landscapes.

If you are feeling responsible for each sip of nectar and load of pollen that your bees bring into the hive, changing your own landscape is just the first step. Your free ranging bees (quoting Farmer Keith) need a community of habitat providers to support their nutritional needs. Next steps could be identifying community members with the power to plant and having conversations with them, addressing barriers to planting (like insufficient incentives to participate in CRP programs) through political action, or encouraging neighbors to participate in innovative programs such as the Bee and Butterfly Habitat Fund's Seed A Legacy project. Through our strong beekeeping networks and clubs, we have the power to really increase habitat, providing much needed growth in honey production for commercial beekeepers, and making life easier for beginner beekeepers, too. BC

Thriving clover bee lawn at the University of Minnesota's Weisman Art Museum. Does the lawn at your favorite art museum feed bees? Doesn't hurt to ask! (photo by Marla Spivak)

Resources

Farmer Keith: **https://www.beeculture.com/wpcontent/uploads/2020/05/MayDig2020.pdf** (p.56)

Representative Peterson's CRP Bill: **https://www.agweek.com/business/agriculture/6787142-Collin-Peterson-unveils-bill-requiring-50-million-acres-in-CRP**

Keeping Bees in CRP (Randall Cass, Extension Educator Iowa State) **https://crops.extension.iastate.edu/cropnews/2020/04/keeping-bees-crp**

Seed a Legacy Program **https://www.beeandbutterflyfund.org/**

*Mendel is the MHPA Secretary and Masterman is a board member

Acknowledgement

The authors would like to thank Dr. Marla Spivak for helpful edits and suggestions.

Authors

Becky Masterman led the UMN Bee Squad from 2013-2019 and currently alternates between acting as an advisor and worker bee for the program. Bridget Mendel joined the Bee Squad in 2013 and has led the program since 2020. (Photo of Becky and Bridget from 2014, before social distancing).

*To learn more about the MN Bee Squad, watch for the BeekeepingTodayPodcast, sponsored by Bee Culture Magazine at **www.BeekeepingTodayPodcast.com***

The Beehives That Don't Hold Bees, Part 2

Jim **Thompson**

Beehive House - Salt Lake City, Utah

This article was initiated by one of my copper clad postcards. The postcard is of the Beehive House of Brigham Young in Salt Lake City. Here are some of the events in Brigham Young's life. Brigham was born June 1, 1801 in Whitingham, Vermont to John and Abigail (Nabby) Young. Brigham had ten siblings: Nancy, Fanny, Rhoda, John Jr., Nabby, Susannah, Joseph, Phinehas Howe, Louisa, and Lorenzo Dow. His mother died of tuberculosis when he was 14. Brigham was kicked out of the house when he was 16. Thus he became an apprentice to learn carpentry, painting, and glazing trades. The family was primarily Methodist, but Brigham felt something was missing so he converted to the Reformed Methodist Church in 1824.

Brigham Young

At the age of 23, Brigham married Miriam Angeline Work and they had two daughters. In 1830 Brigham was introduced to the *Book of Mormon* and joined the Church of Jesus Christ Of Latter Day Saints, April 14, 1832 and started preaching. Also in 1832, Miriam died and Brigham met Joseph Smith, who was a Mason/ Mormon. 1833, Brigham moved to Kirtland, Ohio and met Mary Ann Angell. They married in 1834. He used his carpentry skills to help build the Kirtland Temple, which was the first Mormon Temple. The Kirtland Temple was dedicated in 1836. Later it was set on fire by the local people who were against the Mormons. The Kirtland Safety Society forced him and other Mormons out of Kirtland in 1837, so he fled to Dublin, Indiana and then to Caldwell County, Missouri. He started planning the exodus of the Latter Day Saints in 1838. Brigham helped build the Mormon Temple in Nauvoo, Illinois and finished it in 1840. May 1, 1846, Brigham and *147-159* Mormon pioneers were forced out of Nauvoo, Illinois. (The number varies depending upon the information source.) They wintered in Nebraska in late 1846 and arrived in Salt Lake Valley July 24, 1847. In 1849, Brigham proposed a new territory for Mormons called the State of Deseret meaning 'Honey Bee'. It covered two states and parts of seven others. However it was never recognized by the United States Government and the proposal was disestablished. The Compromise of 1850 established the boundaries of the states.

The boundaries of the provisional State of Deseret (orange with black outline) as proposed in 1849. Modern state boundaries are underlaid for reference.

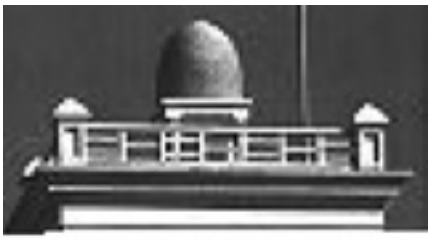
The first name for the residence that Brigham built was Deseret which is a derivation of the word *bt.* Some may say it comes from dsrt which is the red crown of the king of Lower Egypt and pronounced desheret. No bees were involved in this Deseret, but the meaning Brigham meant was to be cooperative work as in a honey bee colony. The pioneers of the Latter Day Saints brought with them five skeps. The Deseret was later renamed the Beehive House and was the primary residence, with offices for the Utah's First Governor (Brigham). The Beehive House was completed in 1854 and had "apartments" consisting of a parlor, bedroom and front door for each occupant. Bee images can be seen with the carved skep on the crown, Newell posts, carvings or impressions on many window and door jambs, and designs on the door knobs.

In 1856, the Lion House was built. It is a house built for the wives and children of Brigham and in the

A stairway post at Brigham Young's House.

Door Knob used on the Brigham Young's Beehive House.

Door knobs used on Mormon Temple, Salt Lake City.



Carved Bee Hive on top of the Bee House.

basement is the dining room that will seat 70 people. Brigham had at one time or another 55 wives and 56 children. Brigham Young did not have a middle name. Brigham died August 29, 1877 and the LDS church changed their views on Polygamy with the 1890 Manifesto that was issued in September, advising against future plural marriages.

Mary Brown Malouf wrote an article May 2, 2016 stating that the word Beehive is everywhere in Utah. It is on businesses, Bail Bonds, a Tea Room, Auto dealers, an Elementary School, a Credit Union, Title Insurance, Glass companies, Insurance companies, scooter sellers, clothing stores and even the dome of some buildings. This is an interesting observation, but the use of the word Beehive was in use long ago, as evidenced by some of my postcards.

There are several more beehive postcards in my collection, but I figured this is enough for now. BC

References:

Behind the Beehive.pdf
Brigham Young's House the humble fabulist.pdf
Brigham Young's Obituary.pdf
Brigham Young Wikipedia.pdf
Brigham Young's Wives.pdf
Brigham Young's Wives and the divorce from Ann Eliza Webb.pdg
Deseret translation.pdf
Masonic Symbols and the LDS Temple.pdf
State of Deseret.pdf
The faithful Young Family.pdf
My postcard collection

Bee Hive village Syria 1931

This postcard is dated in 1920 and is of the Bee Hive Store in Jamaica. Notice there is a streetcar in front of the building.

The Bee Hive Store

A building originally built in 1882-83 for the U.S. Infantry, but in 1921 the third floor was added and building is used for apartments. Its name? The beehive.

There were many Department Stores with the Beehive name and one of the first ones in the United States was the Beehive in California, dated 1890. This picture shows the workers of the store standing out front.

American Foulbrood

Controlling Without Sacrificing Bees Or Using Drugs.

Before parasitic mites and their accompanying viruses came to the shores of North America, the most serious of all diseases, from U.S. beekeepers' perspective, was American foulbrood (AFB). While varroa mites tend to suck up most of the oxygen in the room, AFB is still the most deadly and contaigeous of the honey bee pathogens. Any beekeeper worth their salt should be familiar with American foulbrood, know how to identify its symptoms and what to do to address an outbreak. Seasoned beekeepers can benefit from this review.

As its name implies, the bacterium *Paenibacillus larvae* (formerly known as *Bacillus larvae*) that causes AFB infects bee larvae in their early stages, eventually killing them, and in advanced cases the infected brood give off a foul odor that is very noticeable and vaguely resembles the smell of rotten glue or dead fish. Early in its progression, the pupa melts away like an ice cream cone on a hot summer day as the bacterium consumes it, causing what's left of the baby bee to ooze down into the lowest part of the cell. The pupae turns into a brownish slime resembling the color of milk chocolate. The remains of the brood eventually dry out in the bottom of the cell and create a black scale that adheres so tightly to the cell wall that it is difficult for the bees to clean up the mess, especially since the hive's population is reduced from the action of the disease.

Once a diseased hive has progressed to this stage, the colony is typically so weak that neighboring hives have robbed honey out of the sick hive and spread the foulbrood spores. Compared to healthy brood, whose worker cappings will be slightly raised in shape and light brown in color, the cappings covering the cells containing infants infected with foulbrood will often be dark brown to almost black in color, will have a greasy appearance and a sunken shape, and may be pockmarked with pin-sized holes. Given that brood infected with active *P. larvae* spores fail to hatch, diseased cells can often be found adjacent to healthy brood or surrounded by cells that have been abandoned by healthy hatchlings. As a result, frames of brood in a colony suffering from AFB often take on a spotty pattern, rather than the more solid pattern typical of healthy hives where the queen has laid eggs of similar age all adjacent to one another. Another factor that contributes to the shotgun brood pattern of a foulbrood infected hive is the hygienic behavior of the workers who remove larvae after they get sick or die.

AFB can also be recognized in the field by testing the stringiness of the dead pupae, which are moist and slimy in the early stages after death. When a small twig, piece of straw, or toothpick is inserted into the pupal mass, it will tend to stick to the probe and stretch a quarter to a half inch or so as the probe is removed, much like the sticky, ropelike viscosity of mucus. Dead pupae unaffected by foulbrood disease will not stretch or become threadlike after being poked.

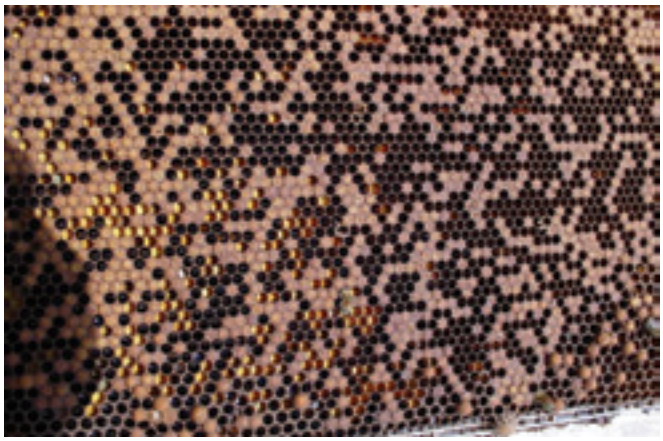
One exception to this is European Foulbrood (EFB). I have found that EFB can also cause infected larvae to stretch out when tested, however the difference is that with EFB, the larvae does not turn chocolate brown. It may still be white, or an off-white color or multi-colored with some parts of the larvae white and some tan, but not all brownish like AFB.

American foulbrood is easily spread, and it can destroy an entire apiary if not attended to quickly. Thus it is vitally important that every beekeeper become familiar with and be able to recognize the symptoms of AFB.

One commercial field test that can be used to detect the presence of AFB is a powdered milk test (Holst Milk Test). This test detects the presence of an enzyme that the foulbrood bacteria release in order to melt down the larval bodies in the final stages of infection. The enzyme will also break down milk protein and will cause a weak solution of powdered milk to clear up within minutes. One teaspoon of powdered milk is mixed thoroughly in 100 milliliters of water (a little less than half a cup), The watered-down milk is then poured into two clear glass vials or jars. As large a sample of brood as possible from a suspected AFB colony is collected with a toothpick and placed into one of the prepared vials. Nothing is done with the second vial of milk. Both containers are then placed in a warm place (such as your shirt breast pocket underneath your bee suit) for at least one hour. If the sample contains AFB the vial with the sample will become clear compared to the control vial.

Vita Bee Health, (aka Vita Europe Ltd) manufactures a wide range of honey bee health products and has also developed an AFB diagnostic kit that allows for fast and accurate field testing for foulbrood producing results in about three minutes. They also have a diagnostic kit for European Foulbrood.

P. larvae is difficult to control because in its resting stage the bacterium forms spores that are reported to live for as long as 70 years or more, until favorable conditions



While a shotgun brood pattern could be a sign of AFB, it isn't always. Varroa *Sensitive Hygiene Bees that remove mite parasitized larvae, a failing queen, and bees leaving open cells in the brood nest in order to make it easier for them to maintain the brood nest temperature are also reasons that a brood pattern may appear poor.* Photo Credit Steve Parise

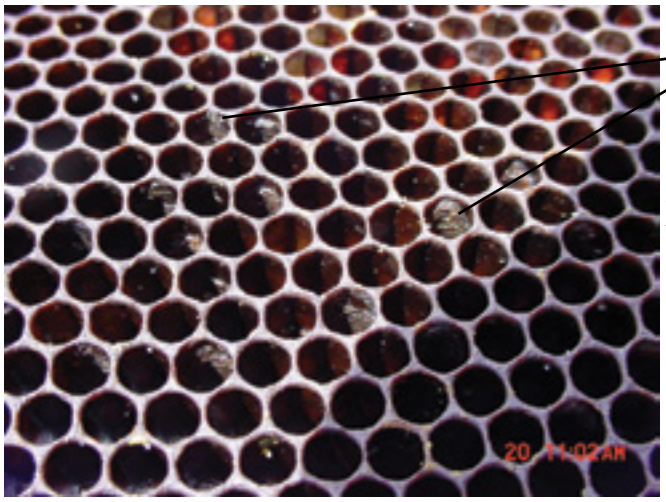
allow it to bloom. AFB is most often spread from colony to colony by bees from a neighboring colony robbing out a dead infected hive and carrying the disease back to their own nest, or by drifters that visit from hives infected with the disease. Beekeepers may also unwittingly spread AFB by interchanging frames between sick and healthy colonies, by not cleaning up diseased equipment from a colony that has died from AFB before it gets robbed out, or by feeding colonies honey contaminated with AFB spores which is taken from diseased hives. Mixing the honey from a questionable source with water to create a syrup and then boiling the mixture for 20 to 30 minutes should kill any spores that may be present and make the feed safe for use though not ideal. This is because when heated, Hydroxymethylfurfural is created in honey and is mildly toxic to bees.

For many years in the United States, the only approved treatment for AFB was the use of the antibiotic oxytetracycline, known commercially as Terramycin. The drug is applied as the active ingredient either in a grease patty or mixed with confectioners' sugar and sprinkled near the brood nest within the hive. However, the patties are not always consumed in a consistent and rapid manner, which creates a situation in which an incomplete dose of the antibiotic is administered to the hive. The use of such patties has been blamed for the Terramycin-resistant forms of AFB infecting some hives. As a result, the USDA has approved a new and more powerful antibiotic, Tylan® (Tylosin), for use against foulbrood disease. This new antibiotic is extremely stable, and rather than being used prophylactically, as oxytetracycline was, it should be applied only when signs of foulbrood are clearly visible and lab results show that the strain of AFB is resistant to Terramycin. The treatment should be applied as a powder mixed with confectioner's sugar and shaken into the hive, to reduce the chances that *P. larvae* will develop resistance to Tylan® as well. (Antibiotics when applied in powder form should never be administered directly into the brood area, or they may kill the developing larvae and pupae.)

No matter how careful one is, however, antibiotic treatments (when they work at all) simply mask the presence of the disease, preventing viable spores from growing and reproducing. Such treatments do not remove the spores from the hive. As a result, hives treated with antibiotics tend to quickly show signs of re-infection with the active form of AFB once antibiotic use is discontinued. In addition, special care must be taken to ensure that honey being harvested does not become contaminated with antibiotics. The regular consumption of minute doses of antibiotics in the human diet has been linked to the development of antibiotic-resistant microbes that cause numerous human diseases that resist conventional antibiotic treatments.

To permanently remove American foulbrood from a colony, all AFB spores must be eliminated from the hive. With a strong dose of determination and an investment of time and resources, this can be accomplished within a single season by removing every bit of drawn comb and beeswax, pollen, brood, and honey from an infected colony. These are all the hive products that will harbor spores. Such an endeavor is best conducted early in the season, so that the hive has the maximum amount of time to build new comb and store adequate supplies of honey and pollen for winter. Also, by taking away a colony's drawn comb early on in its yearly cycle, before egg laying reaches its peak, a minimum amount of brood is sacrificed for the greater good.

The actual process of eliminating AFB from a hive consists of shaking each frame of bees from the hive into a new hive body filled with foundation. Included in the new hive body of foundation should be one empty frame of drawn comb. This frame of comb is left so that the bees have a place to deposit honey they may have engorged themselves with during the process of smoking and shaking them into their new home. The very next day, the frame of drawn comb containing these honey deposits should be removed and replaced with a frame of foundation. The colony should then be fed uninfected honey



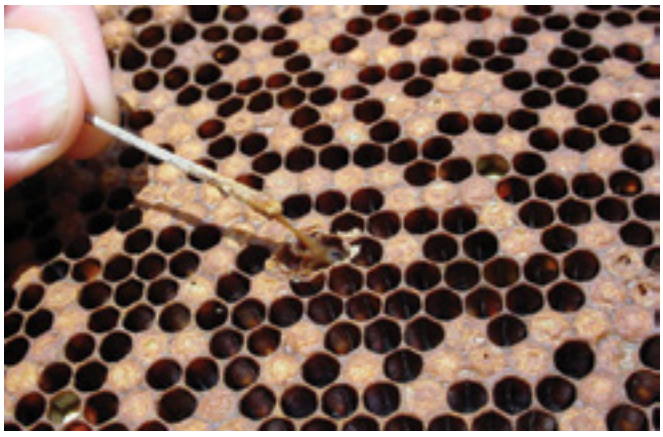
In its later stages, AFB infected larvae melt down and dry out on the bottom edge of the cell creating black scales. These scales are very difficult to remove and contain billions of foulbrood spores. Photo Credit Steve Parise

or sugar syrup so that they have something to get started on and won't starve should cold, wet weather descend preventing the opportunity to forage.

By following this procedure, all the beeswax, pollen, brood, and honey that may possibly contain AFB spores are removed from the hive. All of this material removed from the infected colonies should be burned, and all hive bodies, supers, inner covers, and bottom boards should be scraped clean of burr comb, which should also be burned. The woodenware itself can be scorched with a propane torch or other device that will heat the surface of the equipment to a high enough temperature to ensure that any remaining surface spores are destroyed. This may, or may not be enough to prevent a reoccurrence of the disease once the equipment is put back into use in the bee yard. I did this to my bees in 2002 and it worked. To date (18 years) I have not had any resurgence of AFB despite it being a reoccurring problem for me around the turn of the century.

That said, a 2001 study that looked at the disinfection of wood contaminated with *Paenibacillus larvae* spores and published in *the Journal of Applied Microbiology* by W. Dobbelaere et. al, found that scorching only destroyed spores on the surface of the wood and not those that were imbedded deeper under the surface. To guarantee full decontamination of woodenware the researchers suggest irradiating the equipment with gamma irradiation such as found in a food irradiation facility. Other effective decontamination treatments recommended were chemical treatment such as with a 75 percent solution of chlorine bleach for 30 minutes. However given the water repellant nature of beeswax and some propolized surfaces, obtaining the required concentration over the surface of used bee equipment may be difficult. Heat treatment of infected woodenware such as in an oven for two hours at least 160°F was 100 percent effective while dipping the woodenware in melted paraffin at 120°F for 10 minutes resulted in 99% decontamination. However, when the paraffin temperature was increased to 170°F, complete decontamination was obtained both inside and out.

I am now extremely careful never to allow any questionable frames or equipment to become mixed in among my hives, and I am vigilant in working to prevent someone else's apiary nearby from spreading the disease to my colonies. My primary defense is the hive autopsy as one of the biggest sources of disease infection, and re-infection, are the neglected carcasses of dead hives from other beekeepers close by.



The classic field test for AFB only works during the early stages of the disease before the larvae has dried out and formed scales. Photo Credit: Steve Parise

The keys to maintaining foulbrood-free colonies are regular hive inspections and careful examination of every colony that dies for signs of disease. Once your hives are disease-free, regularly removing a couple of the old, darkened combs from the colonies each year and replacing them with frames of foundation will serve to reduce the opportunities for disease spores to build up within a colony's drawn comb reserves. By the same token, one should make it a practice to avoid frames of comb when purchasing equipment. Unless you know that hard chemicals and antibiotics have not been used on the colony and you have a high level of confidence in the source, accepting used frames is tantamount to taking on someone else's problems.

Should I ever discover another outbreak of foulbrood, I will immediately shake the surviving bees onto foundation and once again destroy all the hive's combs and honey. If this option is not immediately available, though, I will move the diseased hive to an isolated quarantine yard until it is possible to do so. It is important to eliminate all combs that exhibit AFB symptoms from your bee yard as soon as possible to avoid having other nearby colonies become infected with the disease. BC

Ross Conrad is author of Natural Beekeeping, Expanded and Revised 2nd Edition, *and Co-author of* The Land of Milk and Honey: A history of beekeeping in Vermont.

Making It With Beeswax

Alice **Eckles**

The pandemic has been a game changer for Shashock's business, and though she's had to cancel in person sales and product sampling, sustainability remains a key part of her mission.

An Interview With Susan Shashock

Thinking of the uses of beeswax and the myriad of businesses that rely on it from fine art to food wraps my mind turned to my neighbor and friend, Susan Shashock of Middlebury, Vermont, who regularly buys bulk beeswax from my husband and I at Dancing Bee Gardens, for her skincare business, Caroline's Dream.

Honey bees make wax when a good honey flow is on and they have more nectar than they can consume or store in a timely manner. Young worker bees secrete clear flakes of wax from eight wax glands located under their abdomen. The bees then chew the flakes and pollen and propolis gets incorporated into the wax giving it the golden color and that sweet familiar beeswax smell. This

Fresh cappings collected from the uncapping tank following the harvest, yields the highest quality beeswax for cosmetics and skincare products.

Susan knows her beekeeper beeswax supplier and puts magic in every jar.

wax becomes the architectural material the bees use to create cells for baby bees and containers to store their honey and pollen in. It's a wonderfully moldable material.

At Dancing Bee Gardens we harvest beeswax as we go through the hives, cleaning excess beeswax off inner covers and anywhere it seems unnecessary or in the way. We simply scrape these little bits into a "wax box" and when enough is collected we add it to our home made solar wax melter. The construction of a passive solar wax melter is covered in an article by Ross Conrad in the July 2019 issue of *Bee Culture*. Also we have found that removing old frames of comb from the hive is one of the best things we can do for the health of our hives, so we try to do it often. Older wax will absorb and hold environmental pollutants over time, just like fat in the human body. The old combs also go into the solar melter. Cappings wax from the honey extracting process is placed outside on a sunny day after being recovered from the uncapping tank once the honey has been drained, to let the bees clean up the last bits of honey in the cappings. The cappings wax is special: newly made, light, and clean making it the highest quality wax obtainable. This special cappings wax is reserved for skin care products like Susan's and we keep it separate. To keep her production costs down though Susan buys the wax from us in its raw state, as a blob strait out of the wax melter, still needing to have the honey, pollen and propolis cleaned out of it.

They say good business is about relationships and I think it's interesting how circles of relationships overlap in this example:

Dancing Bee Gardens' relationship with honey bees, Ross Conrad of Dancing Bee Gardens and Susan Shashock of Caroline's Dream both involved in local politics are friends, and Susan Shashock buys DBG beeswax for her cosmetic line. Susan Shashock sells her products at Elmer Farm Community Supported Agriculture in Middlebury where Ross Conrad has one of his beeyards and where we also sell our products. It starts to seem like it's all one ball of wax! But beeswax has a different place in different businesses. My talk with Susan about beeswax in her business sheds more light on the comb.

Beekeeper businesses stimulate the local economy in many ways by wholesaling products from their hives as well as through pollination and other services. Beekeeping businesses provide supplies and services for

mead makers, farmers, artists, health and beauty product makers, and still other industries. Recognizing this good that comes from what we do as a beekeeping business inspired me to ask Susan Shashock about her business and how beewax comes into it.

Alice Eckles – How did you get started making your products?

Susan Shashock – I started because I wasn't finding the products that would work with my sensitive, acne prone skin. I tried them all and got so frustrated, that I took a class on how to make my own. That first moisturizer that I formulated specifically for me worked so well that I started making some for gifts and experimented with making other formulas for family and friends. In a few years enough people wanted to buy them that I was able to start a company.

A.E. – How long have you been in business?

S.S. – This coming April will be 20 years of Caroline's Dream, LLC.

A.E. – Has your business changed over the years?

S.S. – It was mainly a hobby for the first 10 years. I dabbled mostly in local wholesale and direct sales to family and friends. I did get a wonderful Canadian wholesale account during this time that explains the French translations on some of the labels. It was wonderful to have a creative outlet when my kids were young.

The second 10 years I shifted my focus from wholesale to more direct sales online and through local delivery on my electric cargo bike. I partner with a local farm CSA to deliver during Farm pick up days and will be expanding this concept in 2021 with more CSA's. I also started making a private label line for a cooperative of Vermont emu farms and I occasionally custom formulate for other small companies.

A.E. – What's your business mission?

S.S. – My baseline is functional beauty. I create high-quality products that work for busy people, supporting their active lives. I keep my prices low in comparison to my competition to keep natural skin care accessible to more people.

A.E. – What inspires you most about your work?

S.S. – I love matching customers to the right product for them. I love formulating and production days the most. I learned long ago that I need to create with my hands on a regular basis to be happy.

Master beekeeper Charlotte Anderson photographed one of her worker bees producing wax scales from the glands on her abdomen. This photograph is from her website ***https://carolina-honeybees.com***

A.E. – What keeps you going, interested, and enthusiastic?

S.S. – I love getting outdoors. I hike, bicycle, and travel as much as possible. I've been practicing yoga for 25+ years and I read and follow local politics.

A.E. – How has Covid influenced your business?

S.S. – It's been a game changer. I spent a lot of time and money last year investing in marketing and events that were canceled or fell apart. My sales in January and February were my best ever but they crashed in March and are only now returning. My previous marketing relied on in person demos that are now unacceptable, as well as tester jars on shelves, and indoor pop-up shops. I've pivoted to develop no contact deliveries and refocus my online newsletter.

A.E. – I know you encourage others to make their own products as well. Before I ask you some more beeswax-centric questions I want to share with our readers my Beeswax Aromatherapy Balm recipe:

At the end of Summer I make an herbal salve with the abundance of fresh herbs available. In the Winter with short dark days and a snow covered garden, I decided to try making an uplifting woodsy perfume balm.

Here's the recipe.

I/4 cup beeswax
1/4 cup olive oil (or other oil of your choice)
80 drops more or less of essential oils (I used cedar, fir, and lemon grass)
Containers to hold your perfume (I used little tins I found at a food co-op.)
Pouring container such as a measuring cup with pour spout. (Not plastic of course!)

You might want to make a few or a bunch of different scented batches. Try mixing your scent first to make sure you like it. To get a pleasing balanced scent experiment with using three different essential oils that you can classify as being a high note, a medium note, and a low note. These are subjective classifications but once you decide on them using your nose, try a mix that is mostly the medium note, about half or less of the low note, and just a hint of the high note. Or you could just use a single essential oil.

Cleaning beeswax is made easier by melting it in a solar wax melter. Most of the debris in the wax gets left behind in the melting tray of the melter. The melted beeswax flows into a water filled bucket below creating a freeform blob shaped by the water and the container."

Use a double boiler on medium heat to melt the beeswax and olive oil or other oil of your choice together. Do not over heat. You shouldn't see smoke! If it seems too thick for your liking you can add more oil.

Get your containers ready to pour into. Make sure they're on a level surface.

Take the melted mixture off the heat and add the essential oils. If you're making different batches of scents you'll need to divide the melted mixture and add the scent separately to each batch.

Next use a heat safe pour spout container to pour your melted scented mixture into the containers. You might try just one first letting it harden quickly outside or in the refrigerator, then testing it to see if the scent is the right strength. You can adjust the amount of essential oils at your nose's discretion.

Once these perfume balms cool and harden you can put on the lids and have fun labeling them and sharing with friends. Who doesn't need a lovely scent or breath of fresh air?

If making all your own skincare products seems like too much trouble, and you'd like to try Caroline's Dream's products, treat yourself to at **https://www.carolinesdream.com/** with a one use per person 10% off discount code. Enter the code BEE during checkout.

A.E. – Now let's get down to beeswax tasks. Tell me about all the different products that you make using beeswax.

S.S. – All of my products use local Vermont beeswax. Three face and body creams, foot cream and a Chamois Cream which is anti-fungal and anti-chaffing for hikers and cyclists. I have three different lip balm's, medicinal salve, sunscreen and deodorant.

A.E. – Why do you use beeswax in these formulations, and where do you find quality beeswax?

S.S. – I love the properties beeswax offers as a natural ingredient that I can buy locally and it offers a mild, delicious scent. It makes the creams particularly creamy. I use only Dancing Bee Gardens beeswax for my products. I sometimes source other locally sourced beeswax for the private label line.

A.E. – I know you buy our beeswax in its raw state straight from the solar wax melter. Do you process it any further, and how much beeswax do you go through per year?

S.S. – I melt and filter it then let it harden into small, easy to use chunks. I do a rough filter though, I'm not trying to get every bit of propolis, pollen and honey out. That's the good stuff that makes my products extra special. Previous years I used 25 to 40 pounds of beeswax, this year it's been less.

A.E. – What have you learned about working with beeswax?

S.S. – I have learned that all beeswax is not the same. When I experimented with wax purchased in bulk from wholesalers, my creams were affected. Maybe I was the only one to notice but they did not blend as creamy, and the yummy beeswax scent was noticeably diminished.

A.E. – Would you ever consider substituting another type of wax or ingredient for beeswax in your recipes?

S.S. – No. I would never use petro chemical or soy waxes. My products are certified Paleo and my competition in that category mostly use tallow. I prefer the smoother and thicker finish of beeswax.

Susan is happiest making it with beeswax on production days.

A.E. – What's your experience finding suppliers of beeswax?

S.S. – I'm fussy about sustainable practices being in place for my ingredient suppliers and have experimented a few times finding other sources. I think you and Ross at Dancing Bee Gardens and I are on the same page and we are a good fit.

After speaking with Susan I have to agree. We are not only on the same page but we're on the same cottage industry scale. You've probably heard of Burt's Bees and maybe even Bee's Wrap, they're some of the bigger companies that have made beeswax a prominent part of their product.

Many materials of the earth and nature have lent themselves to the creative needs of humans over the millennium, for example: clay, stone, and wool. But the human relationship with honey bees and the use of beeswax in value added products going back to prehistory seems extra special for the long-standing universal value of beeswax and the inter-species cooperation since the very first farmers kept bees...around 9,000 years ago. We've had our ups and downs but we're still in bees-ness so to speak, and it's a source of great hope and inspiration that we can go on, relating, creating, and bee-ing.

As I write this it is Thanksgiving Day and I reflect upon how I am thankful for the drones who sacrifice themselves for the good of the hive, the workers who lift and carry, and to the sacred mothers who pivot eternity with each new queen's generation. I'm grateful for the bees, the beekeepers, and the opportunity to make something of it. BC

Alice Eckles is the author of The Literature Preferred by Wild Boar, *a novel. While she sometimes assists in beekeeping, she mostly handles the value added parts of the beekeeping business she shares with Ross Conrad and has fun exploring the intersection of beekeeping and art via her artist business* ***AliceEcklesStudio.com****.*

BIGGER PICTURE

Jessica **Louque**

Facebook University

It is pretty obvious that people have been home too much. The internet has always been a little bit of a wild territory with people on social media, just because of the anonymity and distance given to users. People are much more likely to be rude, condescending, and harass people than they would in person. With the pandemic being both politicized and medically-based, it is amazing to watch the people that suddenly have a doctorate in political policy and medicine. As beekeepers, we already had a lot of this floating around in our community, and now it has expanded to some impressive proportions with the inability to communicate face-to-face with others.

The internet could have been so useful. Now, you can't trust just about anything you see or read or hear. Everyone has some sort of motive behind whatever they say, and the people telling the truth are just as frustrated as the people trying to find it. Imagine working diligently on a project, going through peer review, and then having your work published. Then, the people reading it are hobby beekeepers who are online a whole lot more than they used to be, and they critique the work you did with no prior knowledge of anything used as the basis of the research, or how the research even works. I've seen countless people argue with articles posted in my own state's Facebook group postings and it has to be just for the sake of arguing. If they're proven wrong, they just double down on the ignorant "fake facts" they posted and act like it must be true because they either "read it somewhere on the internet" or made it up in their heads because it sounded logical to them. It's like watching someone try to put a puzzle together, thinking they are a master of puzzles, and they can't figure out that it's three different puzzles thrown in the box and maybe 17 pieces are missing. You throw them the missing pieces and they insist they don't need them. Anyway.

Maybe some people are bored and trying to pick a fight to pass the time, but it seems like most people just think they have superior knowledge to everyone else and nobody is on their level. I can't say much because if someone particularly catches my eye as a Pompous Poster, I will join in the action to amuse myself. Typically, I prefer not interacting with people, especially in the beekeeping forums. You just can't convince anyone they might be wrong and it's not usually worth my time. Sometimes . . . I just can't help myself. I try not to be mean, but also specifically point out everything that was wrong with their argument. I have even requested to speak at bee meetings before to address issues that have come up in arguments when I knew the person was part of that association. They don't usually show up, because people like to be right in their wrongs.

I have some suggestions for you guys who aren't looking to argue on the internet, but you want to learn some information and expand. To be honest, there's a lot of information published in scientific journals that aren't really going to make a difference to a hobby beekeeper for a long time, if at all. If you ever watched the movie "The Devil Wears Prada" there's a scene where Meryl Streep puts Anne Hathaway in her place for dismissing the fashion industry, explaining how the fashion world brought her the blue sweater she was wearing. Work might get published, but it's usually a long way away from being able to be applied in a practical manner to a hobbyist beekeeper. It doesn't mean it's not interesting or useful to know, but just not applicable to beekeeping at the time. A lot of the work done is to understand how colonies work, what makes them tick, and just how they do things in general. How queens mate might not make a bit of difference to how you keep your bees, but knowing that certain miticides may make a difference in how successful a queen is with her mating might make you choose a different chemical than you normally would. Or, it might not because sometimes these studies may be rerun and have different results because one variable was different. Bees can be incredibly tricky to work with since they are a superorganism and they are codependent on so many external factors. If you are reading these articles to improve your beekeeping, look for things that can be applied to your work.

If you're reading to stay on top of the beekeeping and honey bee community news, then you have a lot more options. A lot of the articles can be overwhelming, especially if you don't have a science background. Sometimes I find them annoying and I've been doing beekeeping work for over a decade – albeit not the kind that typically gets published in a journal. It is pretty common for a person reading an article they found that was posted to add a comment below about something they didn't like, found confusing, or disagree with. This opens their comment up

to the entire community and that's really a mixed bag of experience and abilities. It's also common for people to try to point out small mistakes or grammatical errors in publications. I think this is to make people feel better about themselves when they don't understand the content, but I personally think it's rude and condescending. If your commentary isn't adding to the conversation, and you're pointing out something that can no longer be fixed, you're just being a crappy person and trying to bring negative attention to someone else.

If you have a genuine question about the article, even well meaning people answering can still be wrong because of the desire to try to be helpful and feel important posting, but still have incorrect information. If you are just trying to vie for social interaction, lob out some simple questions to bolster other people that know the answer and use it to have a good beekeeper conversation. If you have a true question, the best thing to do is email the authors. Sometimes I think people forget that's an option. Most of the basic methodology of my work stays the same within each study type, but I try my best to go through commentary once the EPA releases to the public to find useful criticism. It's not easy with lots of people writing garbage, but most people conducting studies do like to fix holes in the methodology to make the research more sound. A fresh eye can bring a different perspective to a study, giving you an idea you may not have thought about previously. It can be difficult if there are specific parameters that have to be met though, and usually those suggestions come from other people with research experience.

Most people also spend a lot of time and work and blood, sweat, and tears in those studies and are more than happy to converse with genuinely interested people about the research. If you have questions, it's not often that an author won't respond and will usually tell you more than you ever wanted to know. They will be the true expert on that study because they're the ones that did the work, so they can probably give you the best information on how to dissect the work and take value from it.

If you're a new-ish beekeeper and trying to find classes online . . . good luck. I think our state is doing online beginner classes for the Spring, but sometimes you want information throughout the year and it's hard to reach out to people who can't come in person.

I am a fan of printed books, especially older beekeeping books for accurate information. People are less likely to publish garbage in print because it takes too much work. You can take a few minutes to a few hours and publish on the internet. Books are awesome because you can take them with you to the beeyard if you need to, you can download some of them on your phone or iPad, and you can keep them for reference forever.

Most information on beekeeping hasn't changed all that much. Bees are hungry, feed them. Bees have mites, manage them as best you can. Bees get cold in the Winter, keep them warm. Queens die, get a new one. How you choose to solve each of the answers is the biggest learning curve, but it can depend on climate, environment in general, your race of bees, your beekeeping experience level, and how frisky you are. If you're having hungry bees, do you just do straight sugar syrup? Do you use corn syrup? Do you add a supplement like Honey-B-Healthy? Do you add pollen? Do you make your own pollen patties and if so, do you use pollen powder mix like AP23 or do you buy pollen baskets? All of these things are questions that you have to figure out on your own, largely with the help of the internet. This is the kind of thing that you can find and shouldn't be too controversial on the internet. If you decide that you want to feed your babies pollen patties, and you have the patience to clean up the disaster that pollen powder makes, then there are a decent amount of videos and recipes on how to make them and none of them will particularly steer you wrong. If it ends up in pollen patty form, you probably did it right.

Just try to remember that nobody likes bullies, nobody likes people that point out their mistakes, and everyone will remember who you are and that's not a good thing. Be nice to people and ask questions that are genuine to learn information and make your beekeeping better.

Everybody is having a rough time, so don't make it worse on someone else. Don't make your mama disappointed in your behavior. Also, even if you curse like a sailor in person (I know I do), it takes premeditated effort to curse in a post that you type and people don't take you any more seriously for cursing in a post. Have some respect if you want to receive it in return. Believe me, I know how hard this might be because I have to edit the cursing out of my mental sentences all the time before I type them. I don't bother with spoken sentences most of the time – which may be a problem if we ever get back to normal social interaction. BC

Jessica Louque and her husband Bobby are homebound in NC with kids, bees, dog, cats and more, hoping for a better year.

Almond Pollination Math

Joe **Traynor**

Ask an almond grower what was the most useful class he took in school (including college) and if he (she) thinks about it long enough, the answer should be *math,* maybe algebra in high school, maybe arithmetic in the 3rd grade. Growers are faced with math problems daily – calibrating spray rigs, figuring the amount of chemicals to apply per acre, filling out use reports, making out budgets and calculating ROI (if you're fortunate enough to have an ROI).

Virtually every problem facing mankind can be reduced to a math problem, whether landing a vehicle on Mars, projecting the consequences, if global warming is a valid thesis, feeding a growing world population, reducing pollution, returning a Republican to the White House, etc. Little wonder that our greatest scientists – Newton, Galileo, Einstein, Feynman and many others – were (are) primarily first-rate mathematicians.

Rapidly expanding almond acreage coupled with a static, or diminishing supply of bees is causing the almond industry to confront a major math problem: *can growers get by with fewer colonies per acre?* Here's the original 1947 UC recommendation: *"In general, one hive per acre is ample, even in adverse seasons"* (Extension Circular 103, *Almond Culture in California*). Today, the generally accepted figure is two hives (colonies) per acre, with colony strength rarely defined. Some growers use 2.5 to three colonies per acre as a hedge against poor bloom weather, while others have cut back to 1.5 or one colony per acre but make sure they are getting strong colonies – defined as colonies with eight to 10 frames of bees. Growers that have cut back on colonies have not seen reduced yields, even in 2011, when bloom weather was far from ideal.

Some of the basic math data needed to determine the optimum economical number of colonies needed per acre is given below. Because one can easily get bogged down in this quicksand of data a shortcut (rope) is delivered afterwards. If the heavy dose of figures below is too intimidating, you can cut to the chase further down.

A 3000 lb almond crop has 1 million nuts (assume 350 nuts/lb). Assuming a 50% set of flowers, it would take 2 million flowers to give a 3000 lb crop (recent work by Frank Eischen, USDA, has shown that percent set can vary from 25 to 75%, requiring four million and 1.3 million flowers respectively to attain 1 million nuts).

Almond flowers produce 0.7 to 1.2 mg of pure pollen (up to 2.4 mg of bee-collected pollen; bees add "glue" to pollen). Assuming two million flowers/acre, an almond orchard will put out from five to 10 lbs of pollen per acre. (American Bee Journal, April 2001, pp.287-288)

A frame of bees contains about 1500 bees. An eight-frame colony contains about 12,000 bees; a third of these bees (4,000 bees) will be foraging bees.

Pollen-collecting honey bees usually work four hours/day in almonds (10AM to 2PM). Bees will visit 10 flowers/minute (20 or more, if pickings are slim; less than 10 if they can get a pollen load from a few flowers)

Assuming 4000 worker bees/acre and 100 trees per acre you should see 20 bees per tree during bloom if using one strong colony/acre (about half of those 4,000 workers will be flying or will be depositing their pollen loads in the hive).

20 bees per tree visiting 10 flowers a minute will visit a total of 200 flowers in a minute, or 48,000 flowers in 240 minutes (4 hours).

At 100 trees per acre, there are 20,000 flowers per tree. 20 bees per tree will visit each flower two or more times in one four-hour day (four or more times in two four-hour days). Although it takes only one pollen grain to set a nut, excess pollen deposited on the stigma of the flower stimulates the growth of that one pollen grain.

Individual almond flowers remain receptive for two to four days but are most receptive the first two days after they open (UC).

The effective blooming period (when all flowers are receptive) can be from three to 10 days. The more the bloom is strung out, the more time bees have to complete the pollination job.

Frank Eischen (USDA) has shown that one strong colony, equipped with a pollen trap, can collect six lbs of pollen in a day (12 lbs over a two-day period at peak bloom; significantly less than six lbs/day on the days before and after peak bloom). This colony had to stray out of its one acre allotted area to get six lbs. in a day; pollen traps cause colonies to collect more pollen than they normally would and they do so at the expense of colonies without traps.

An eight-frame colony will collect significantly more pollen than two four-frame colonies. (American Bee Journal, Feb. 1977, p.78; California Agriculture, UC, August, 1970).

Growers Are Faced With Math Problems Daily

Bee flight hours and statewide almond yields, 2011 and 2012

2011: 47 hours, 2650 lbs/ac. 2012: 65 hours, 2550 lbs/ac. (est.) Bee flight hours, courtesy of Tom Dunklee, Global Climate Center are for Merced but hour differences for other almond areas are similar (Sacramento Valley stations averaged only 22 bee hours in 2011).

Now, forget all the above data and calculations – here's the shortcut, the rope: Using strong colonies, honey bees collect the daily ration of pollen provided by almond flowers by 2 PM (or sooner). Walk your orchard after 2 PM and rub the anthers of the flowers between your thumb and forefinger; if the bees have done their job, you should see little or no pollen on your fingers – the bees have finished their work for the day and are too smart to expend valuable energy for a minuscule reward (to verify this, check the entrances of your hives for returning pollen-collecting bees). If there is still pollen on your flowers after 2 PM you need stronger bee colonies or more colonies. Can you get by with fewer than two colonies/acre? Using the 2 PM orchard walk outlined above, it is certainly possible, but make sure you rent eight to 10-frame colonies. The 1947 UC recommendation of 1 hive/acre (with no strength specification) could well hold true today, but only if the hives contain strong bee populations.

Almond pollination is a community effort so make sure your neighbor rents colonies of sufficient strength to prevent your bees from seeking bigger rewards elsewhere. Because one eight-frame colony will collect significantly more pollen than two four-frame colonies, paying a premium price for the stronger colonies is a worthwhile investment. And remember that a *hive* is the structure (usually wooden) that contains the *colony* of bees. Hives can contain 0 to 20,000 or more bees. In any given year, there will always be plenty of hives available for California almond orchards, but not all orchards will be supplied with strong bee colonies.

The argument, and it's a good one, against cutting back on bee colonies goes like this: *I know I can get by with fewer bees most years, but for* that *one year when the bees only get an hour or two to do the job, I want as many bees out there as possible – it's good insurance.* 2011 was a year when intermittent rains confined bees to their hives for extended periods. Bee flight hours for 2011 were the lowest in the 10-year period these hours have been recorded – 22 hours in the Sacramento Valley – yet the 2011 almond crop hit an all-time record of 2650 lbs/acre. Even in a poor-weather year, there should always be enough bee-flight hours between storms to allow strong bee colonies to do their job. If there is only one hour of decent bee weather over the entire pollination period, sure, you would benefit from more bees. Such an event is highly unlikely, but in our current era of unlikely weather events, it's certainly possible. If forecasts indicate a prolonged monsoon event with maybe only an hour or two of good weather over the entire blooming period, then ordering more colonies would be prudent. Although there probably wouldn't be any extra bees in California, beekeepers in Texas and Florida often have bees available after almond bloom starts but would need a few days notice to get them here. Even if extra bees did give you good pollination in a one-hour year, there's a good chance that bloom-time diseases would take your crop.

Note: The data figures given above are, in many cases, best guesses; actual figures can vary 100% or more from those given. Hopefully these figures will be refined in coming years and a skilled mathematician will calculate a more exact figure for the optimum number of colonies/acre that almond growers should use.

When the Pollen is Gone

Once bees have stripped the almond pollen from your orchard, the pollination game is over – no pollen, no pollination. A strange phenomenon, perhaps unique to almonds, occurs when the pollen is gone – bee activity often increases! You will often see more bees/tree *after* your trees have been pollinated. Look closely, though, and you will observe that these busy workers are all nectar-collecting bees, pushing their tongues to the base of the flowers to suck out the sweet nectar. Almond flowers release most of their nectar *after* the flowers are pollinated. We learned in grammar school that flowers produce nectar to attract bees to transfer pollen, so what's going on here? At this time, we don't know. Although there is no proof, some have speculated that the sugar-laden almond nectar nourishes the small developing nutlet, helping it to survive post-bloom nutlet drop. Some growers release their bees after all the pollen is gone, but most won't release bees until they see no more flowers. If you decide you want all or most of your bees removed from your orchard when there are still many nectar-collecting bees working (but no pollen-collecting bees) you may find beekeepers reluctant to move them out, as almond nectar is a valuable food source for bees. Unless bees have another flower source to go to (as would Florida or Texas bees) they are better off remaining in the orchard until the last drop of almond nectar has been extracted.

Beekeeper Math

Beekeepers that attempt to satisfy almond growers demand for strong bee colonies are faced with a difficult choice: spend the necessary money to produce such colonies, or rent weaker colonies at a reduced price. According to UC Extension Apiculturist, Eric Mussen, *"four frames of bees is the size a Central Valley California colony is likely to be (if it survives) when it is not fed extra syrup and protein during the year."* (Jan/Feb 2010 Newsletter, *From the UC Apiaries*). Dr. Mussen estimates that beekeepers must spend $120/colony to provide four-frame colonies and $200 to $220/colony to provide 8 to 10 frame colonies (these cost figures are likely 10% higher for 2013 than they were in 2010). A beekeeper is better off, probably far better off, renting a four to six-frame colony for $150 than renting an eight to 10-frame colony for $200. Even with record almond pollination fees, building high bee populations that continue to consume expensive feed during the Winter (both before and after almond bloom) does not make economic sense for many bee operations. With *Varroa* mites, viruses and diminished bee pasture taking an ever-mounting toll on honey bees, today's beekeeper feels fortunate if he can cover operating expenses, let alone attain an ROI (a term foreign to many beekeeping operations). BC

WINTER FEEDING

Tina **Sebestyen**

One of the things I love about horizontal hives is the way we can help our bees in mid-Winter. The configuration of the hives allows us the opportunity to help the bees in Winter, besides being our handicap. In a Kenyan top bar hive, the bars create a solid roof over the bees, so that many of the bars can be removed without ever exposing the cluster. In a long Langstroth hive, the use of either wooden slats over the combs or a burlap cover affords the same protection of the cluster.

First, a word of warning – it is entirely possible for a tiny cluster of bees to make it through winter, only to be killed by curiosity. This means you! Exposing a cluster with few bees can cause their deaths, because it is so disruptive, and the cluster cannot recover from the lost heat and humidity. It is difficult to resist exploring to see where the bees are if you can't see or hear bees. It is human nature to want to know what happened. If a tiny cluster is surviving, however, you have just ended it for them. Ask me how I know.

Here is the process for safely checking on a colony in a top bar hive or long Langstroth hive, and adding food if necessary. Start at the back of the hive, well behind the cluster, removing bars or frames until you begin to see a few bees moving around (the temperature should be at least 40 degrees). The queen will have started laying eggs soon after the winter solstice if there is enough bee bread in the colony, and if she has enough bees. The cluster must keep the brood nest at a balmy 96 degrees, so it is important not to open the brood chamber. Set aside the empty frames or bars and scoot full ones forward, to just behind the cluster. If you saved a sheet of bee bread in the freezer and have thawed it, place it first, right behind the cluster. Put all of the empty frames or bars in at the back of the hive, away from the cluster. Once the queen starts laying eggs, the cluster is anchored in place, and the bees must be able to break cluster, go get food, and return to the cluster. Moving food stores makes it much easier and safer for them. Sometimes in spring, a dead colony will be found with bees spread out instead of clustering. This may have been because there was no queen, but sometimes it is because they were on a mission to get food, a cold snap descended suddenly, the bees were paralyzed by it, and could not return to the cluster. By moving the honey closer, we keep the bees from having to trek so far.

Feeding pollen substitute in Winter can be dangerous. It encourages bees to raise brood when they shouldn't, or to raise more than they can afford. Italian bees especially get going on raising babies, and forget that it might be a long time before incoming nectar makes up for dwindling honey in the hive. Most commercially produced Winter patties do have some pollen substitute, but it is much less than

one would give a colony in Spring or Summer. Having a sheet of bee bread in the freezer to thaw and give in late Winter is the perfect answer. It allows them to start raising brood when conditions are right without causing seasonally inappropriate amounts of brood rearing.

A difficulty in horizontal beekeeping is emergency feeding if it is discovered that the bees have eaten *all* of their stores. We can't simply lay sugar on top of the bars as in regular Langstroth beekeeping. It is possible to have the lid of a long hive made in such a way that there is space for bee candy. This makes the lid much bigger and harder to handle. It is too cold in much of the country to feed sugar water.

A better plan is to make candy for the bees. Using the same recipe that is used for regular Langstroth hives, we make our bee candy so that it can go in a frame or hang from a top bar. Take one of the top bars with drawn comb and use it to make a template out of cardboard to hold the sugar in the right shape while it sets. Lay the drawn comb on the piece of cardboard, and without cutting through both sides of the cardboard, score the surface with a utility knife, and then turn the cardboard over. Bend the cardboard towards you along the score lines. Use duct tape to help it hold its shape. Now, on a top bar that has no drawn comb, bend and staple on a piece of ½" hardware cloth (or whatever you have) to act as rebar for strengthening the candy. Lay the top bar with hardware cloth inside the cardboard form, ready to receive the candy. Mix one tablespoon of water to each pound of sugar using the dough blade in a stand mixer, or just mix with a wooden spoon and your hands. Press the resulting mixture into the form and around the hardware cloth and allow it to set in a sunny spot for two or three days, until it is hard enough to pick up without crumbling. Hang this bar in the hive, right in front, or right behind the cluster for easy access. A similar bee candy frame can be made for the long Langstroth. Just press the candy right onto plastic foundation.

Pressing about four pounds of sugar mixed with four Tbs. of water onto ½" hardware cloth "rebar" on a top bar, in a cardboard form the exact size of a drawn comb.

For true "emergency" feeding, there is nothing like having a frame or bar of honey comb frozen to thaw and give back to the colony. I would have left the extra honey comb in the colony, so if I discover a cluster of bees alive, but with no honey at all, it is time for drastic measures. It is possible to give them 2:1 sugar water right in their empty comb. Take a comb as close to the cluster as you can without disturbing them. Hold it over an empty five gallon bucket to catch the drips, and using a bike bottle, shoot the sugar water into the comb. It is difficult to get it in, so use good pressure in a thin stream. Sometimes it helps to rub a finger over the comb to break the air bubbles under the water.

Feeding liquid feed inside or in hive top feeders in cold weather can be dangerous for bees. In a hive top feeder, the liquid gets cold over-night, and the cold attracts the condensation from the bees' respiration. The condensation can then drip down onto the cluster of bees. Wet bees are dead bees. Even using a frame feeder can be dangerous for them, since when the bees ingest the cold liquid, it paralyzes them, and they fall in and drown.

On days that are warm enough for the bees to fly, you can give them liquid feed away from the apiary. If we were to feed them outside the hive, but in the apiary, the bees would have difficulty communicating to each other about the location of the feeder. Or, they might just get used to being fed in the apiary, and once the feeder is no longer present, they might decide that they can get food from the other hives nearby. Feeding liquid feed inside the apiary causes robbing. Place your feeder at least 100 feet away to avoid inciting robbing. The simplest feeder for this time of year is a five gallon bucket without a lid. Float straw or Styrofoam pellets to keep bees from drowning, or stand twigs in the bucket for bees to walk in and out on (the bees love this best). My bees often fly as soon as it is over 42 degrees, cool days get even cooler early in the afternoon. The bees will be so intent on gathering as much food as they can that they will stay out much later than they should. Go out before it gets too cool, and bang on the side of the bucket until all of the bees fly out, so that you can bring it in, in plenty of time for everyone to safely fly home.

Late Winter is a dangerous time for bees when they are most likely to starve. Don't let it happen to you! BC

VACCINATION

Of Honey Bees Against American Foulbrood

Daliel **Freitak**

Brood diseases in honey bees are caused by various bacterial, fungal and viral pathogens. These pathogens target the brood (the eggs, larvae and pupae of the hive) and are especially heinous. The growth of the hive is hindered, and in the case of a high infection rate, the colony is lost. The majority of the brood diseases, if not all, are globally distributed, and are causing serious ecological and economical issues worldwide.

One of the most devastating global bacterial brood diseases of the honey bee is American Foulbrood (AFB), which is caused by *Paenibacillus larvae. P. larvae* is a gram-positive bacterium which can form nearly indestructible spores that are viable in the environment for up to 70 years[1]. AFB has a very short infection window. It can only infect freshly hatched larvae, not more than two to three days old. All other individuals in the beehive are resistant. Despite this very specific age-dependent infectivity, it is one of the most detrimental honey bee diseases. It can spread quickly within and between beeyards, causing hives to collapse extremely fast. Hence very strict measures are in place should infection surface in any one hive. In many countries the entire apiary needs to be quarantined and the infected hive(s), bees and equipment in contact with those hives must be burned. No truly effective measures exist against AFB, though prophylactic treatment with antibiotics has been used for some time now. The use of antibiotics has led to number of negative side effects, as the bacterium becomes more resistant to the medication, and the honey cannot be sold for consumption after treatment. In addition, evidence has emerged that antibiotics can harm honey bees' microbiome[2], making them less capable of fending off disease and other environmental threats. To date no real prevention for AFB, or any other brood disease, has been available.

Dalan Animal Health, Inc. is a startup founded on basic research aimed to understand how honey bees transfer the protection against a disease from one generation to the next. Historically, vaccination of beneficial insects, such as honey bees, was deemed unfeasible since these animals lack the antibody-based, acquired immune system present in vertebrates such as humans. Our breakthrough in the understanding of immune priming in honey bees indicates that vaccination can occur via the mother insect, namely the queen. This phenomenon, coined 'trans-generational immune priming', was first observed a decade ago, but the mechanism remained poorly understood. We have studied immune priming in insects[3] including honey bees and discovered that queens use the protein vitellogenin to transfer immune elicitors to their eggs. Vitellogenin is a major egg-yolk protein which makes up to 98% of total dry weight of the developing egg. During embryogenesis, vitellogenin is broken down and the pieces of

it are used as nutrients for the developing embryo. We found that this protein binds directly to both Gram-positive *P. larvae* (the American Foulbrood bacterium) and Gram-negative *Escherichia coli*, as well as to general bacterial and fungal pathogen-associated molecular pattern (PAMP) molecules. Furthermore, vitellogenin is able to transport bacterial molecules to the developing eggs[4]. The presentation of PAMPs to the egg triggers and adjusts the immune system of the new insect to increase resistance against the pathogen from which the PAMPs originated. The queen may encounter bacteria via food, at which point these bacteria are broken down by the digestive system and the resulting fragments transferred to the body cavity, where they are collected in the fat body (a liver-like organ in insects). This is the primary site for the synthesis of vitellogenin prior its transfer to ovaries.

This antibody independent immune priming mechanism has allowed Dalan Animal Health, Inc. to start the development of a vaccination program for honey bees. Vaccination of pollinators is a completely novel, unprecedented project, as there are no current nor former vaccines available for insects. We have selected AFB as the first pathogen target for vaccine development due to its significant contribution to the global decline of bees. The pathology of the disease and the stability of the spores make it extremely hard to control American Foulbrood. The most efficient way to reduce infection would be to increase AFB resistance in early larval stages. This is exactly the approach of our vaccination method. The vaccine will be administered orally via food to honey bee queens, who then lay eggs, from which more resistant larvae will hatch.

Without a doubt, we can say that vaccination of humans and animals has changed the world. As a result, life-expectancy has increased, mortality due to infectious diseases has decreased, and many illnesses once considered fatal are now rarely encountered. Dalan Animal Health, Inc. has completed proof of concept studies indicating that vaccination may be an effective control measure in honey bees as well. We are currently pursuing USDA licensure for an AFB honey bee vaccine. Our discoveries in insect immunity and the successful vaccine pilot data create a foundation for the first oral vaccine for honey bees against a disease that handicaps apiculture and pollination-dependent agriculture. BC

References:

[1]OIE Terrestrial Manual (2018) – Chapter 3.2.2. *American Foulbrood of honey bees (infection of honey bees with* Paenibacillus larvae).

[2]Daisley, BA et al. (2020) – *Missing Microbes in Bees: How Systematic Depletion of Key Szmbionts Erodes Immunity*. Trends in Microbiology, In press.

[3]Freitak et al. (2014) – *The maternal transfer of bacteria can mediate trans-generational immune priming in insects.* Virulence, 5:4, 547–554.

[3]Salmela et al. (2015) – *Transfer of Immunity from Mother to Offspring Is Mediated via Egg-Yolk Protein Vitellogenin.* PLoS Pathogens 11 (7): e1005015.

Buzz Off Or Bee Kind

Lindsey **Roberts**

Lindsey is a Psychologist working in the NHS in the United Kingdom and has started a postgraduate course at Hartpury University in Human-Animal Interactions.

In my humble opinion, bees are absolutely incredible. Not only are they intelligent beings with behaviour that is *so* intricate researchers are still trying to decode it such as the waggle-dance which is used to inform other bees of where the best flowers are located in reference to the sun, but they are also a eusocial species, meaning they act in social ways that benefit the entire hive, even at a cost to their own individual reproductive success (Alemida and Porto, 2014).

As well as being inherently altruistic, bees also share the conscientious personality trait alongside (*some*...) humans, which can clearly be seen in their perfectly formed hexagonal cells, carefully constructed from beeswax. The idea that bees have differing roles but all work together in pursuit of a common goal to please their queen and maintain hive harmony, is seen as hugely adaptive from our human perspective and is not too dissimilar from many of our own societal and cultural constructs that we strive to maintain.

The relationship between humans and bees has been recorded as over 9,000 years old (Roffet-Salque *et al.,* 2015). For instance, people originating from the Stone Age were found to have harvested and used bee products (Dams and Dams, 1977), while traces of beeswax have also been found in Europe and Africa from the Neolithic period (Roffet-Salque *et al.,* 2015). Ancient Egypt bee iconography dates back to at least 2400 BC (Crane, 1999) and even the King of Lower Egypt adopted the bee as his symbol in hieroglyphs. The intrinsic value of the bee's ability to pollinate plants was well understood and hives (also designed in pyramid form) were transported along the Nile to crosspollinate flowers and crops throughout the country. For the ancient Egyptians, honey produced by bees was not only a form of food but it was also a form of payment; for both the living *and* the dead. Honey held such a spiritual significance that the dead were embalmed in honey and 2,000 year-old pots of honey were found unspoiled alongside tombs as offerings in the afterlife (Plant Bee Foundation, 2017), indicating that ancient Egyptians also had an enduring love affair with the honey bee and their produce.

In the 21st century, we know more about the secret life of bees than ever before yet some things remain the same. Honey is still being consumed by people, applied as a wound dressing and appears as a key ingredient in a range of cosmetic products alongside bees wax – just as the ancient Egyptians did. Bees appear in our historical literature and popular culture as represented by films *('Bee Movie')* and as symbols of 'busy-ness', beauty and nature, that have re-emerged across fashion and home décor prints and accessories. Many well-known expressions are derived from bees including *'busy as a bee'*, *'the bee's knees'* or to have *'a bee in your bonnet'*. Yet bees are also capable of stinging people through a one-time individual sting or *en masse* to protect a hive.

While the majority of people know very little about insects *per se*, public-perceptions of bees are being shifted through education and wildlife campaigns to encourage an appreciation that bees are essential for pollination of plants, human well-being, a healthy planet, and a healthy economy.

Forbes cited bees as responsible for up to $577 billion worth of food production and without them 39 crops would go into rapid decline including almond, blueberry, squash and watermelon. Honey production is a stand-alone industry valued at $7 billion worldwide and honey production is said to have amassed a whopping 447 thousand metric tons in 2018 (Statista, 2020).

Without bees, humans would have to rely on more invasive agricultural practices to yield similar food resources, reducing biodiversity (Forbes, 2019) and increasing global famine and the effects of climate change (Neumann and Carreck, 2010). In turn, climate change would limit honey-bee behaviour, reproduction, development and overall health that would lead to mass extinction (Le Conte and Navajas, 2008); threatening our own existence too. However, it is not just climate change that threatens bees and their colonies, some pesticides used in the agricultural industry are killing bees as well as their plant-munching counterparts, such as slugs and caterpillars. This appears completely counter-intuitive: bees are needed to pollinate yet we are killing them in the process!

A study conducted by Neumann and Carreck a decade ago demonstrated that sudden losses of bee colonies are occurring to the point of a 'world pollinator crisis', known as Colony Collapse Disorder or 'CCD' (Figure 1).

The CCD phenomenon is attracting much media attention and can be attributed to many combined factors e.g. poor weather conditions preventing bees from flying and feeding, infections that cause paralysis, infestation of *Varroa destructor* mites (Figure 2) and starvation owing to a decline in the ratio of nearby flowers to the number of hives in any given location.

Given the catastrophic nature of CCD and its implications for human health, why are we not doing more to save our beloved bees from an ethical, moral and collective survival standpoint? It appears the answer may be best understood in terms of our own attitudes and beliefs to promote changes in human

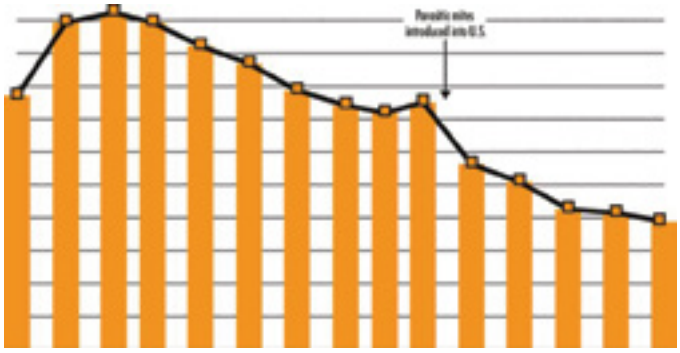


Figure 1. *U.S. honey producing colonies, parasitic mites and CCD (Kluser, 2010)*

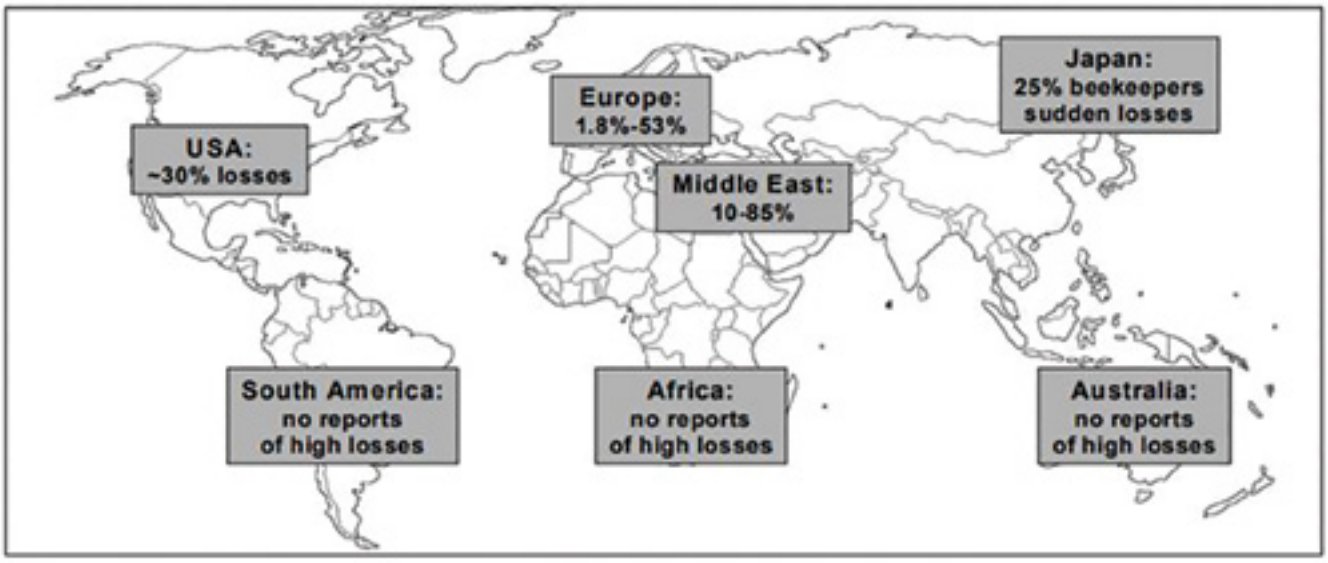


Figure 2. *The global problem of honey bee colony losses associated with* Varroa destructor *mites above and below the equator line (Neumann and Carreck, 2010).*

behaviour. For instance, we know that human attitudes towards a species directly affect their welfare (Serpell, 2004) and we also know that in order to change human behaviour in relation to our environment, we have to challenge people's thoughts, values and beliefs (Prager, 2012). However, global change doesn't *just* occur at the individual level: values held about a species from a societal perspective include within and between cultural differences (Szucs, 2012). It is also known that cross-cultural differences are present in the perception of insects both in terms of their perceived danger and our willingness to protect them (Schönfelder and Bogner, 2017).

Generally speaking, people do not like insects. Negative human perceptions of insects tend to range from mildly annoying, 'creepy crawlies' (e.g. flies and mosquitos) to outright fear inducing beings that are capable of inflicting pain (i.e. wasps). Yet many species such as butterflies and bees are considered beautiful and revered for their physical and utilitarian attributes. If we delve further into the research surrounding insects we find multiple contradictions and irregularities. Researchers have stated that humans find interactions with insects "complex, unsettling, and rewarding" (Lemelin *et al.,* 2017), so what is it that makes some insects fascinating and important over disgusting or terrifying?

Recently, Raynald Lemelin and his Canadian colleagues conducted a study to investigate this important question and explored the variability in human perceptions of insects. They explored 'personal meaning' surrounding insect species before and after 280 study participants had watched a six-minte video showing a multitude of insects and behaviour. People's descriptions before the video, and focus group accounts following the video were recorded, coded and analysed. Study results highlighted that bees (n=254), ants (n=200), butterflies (n=162), dragonflies (n=52) and ladybugs (n=44) were considered to contribute positively to the ecosystem or have intrinsic value.

Conversely, flies (n=289), mosquitoes (n=200) and wasps (n=78) were seen to be harmful and not provide any utilitarian function to society at all. While expressions of 'amazement' increased following the video footage, many more perceptions decreased for insects that were already disliked and even became 'hated'. They concluded that human interactions with insects tended to rely on prior childhood experiences, education and/or the inference that a species is 'similar to us' in terms of features and characteristics as explained through an anthropomorphism lens (i.e. the projection of human emotions or traits onto non-human animals); or the degree to which insects are absolutely 'not like us' and are something to be feared from an entomophobia perspective (i.e. a phobia related to insects that causes intense anxiety).

It is unsurprising that bees are considered in a more favourable light than flies or mosquitoes; they tend to be brightly coloured, fluffy and can produce honey, beloved by humans and bears alike, so what can we do to protect them? From a psychological perspective, we could adopt either a topdown or a bottom-up approach to the protection of bees. A 'top-down' approach to conservation would involve national figureheads, policy-makers, agricultural farming experts, ecologists and entomologists working together to decide upon and advocate for a global initiative that all nations must adhere to in the short and long-term for bee preservation. While a 'bottom-up' approach would support the ability of individuals to make a difference *on the ground,* in its most literal form!

Bottom up approaches would encourage children to spend time outdoors and become inspired by nature, educational programmes around insects and bees to dispel myths surrounding them and to create an affinity for 'all creatures great and small' across all cultures. This in turn would promote a sustainable culture towards taking care of, and protecting nature into adulthood worldwide. For adults who are open to new experiences, bee keeping can be a fantastic opportunity to learn a new skill, create your own honey

and even set-up a new business! Keen or novice gardeners can also support local colonies by planting bee-friendly flowers and plants as advertised by local gardening centres while spending very little money or having extensive green space. Collectively, a bottom-up(individual→societal→cultural) and a top-down (cultural→societal→individual) approach that meets in the middle to protect the humble honey bee, might just save them *and us* from a global catastrophe, and what fun it could *bee* along the way! BC

References

Alemida, E. and Porto, D.S. (2014) *Investigating Eusociality in Bees while Trusting the Uncertainty.* Sociobiology 61(4): 355-368 (December 2014): **DOI: 10.13102/sociobiology.v61i4.355-368**.

Crane, E. (1999) *The World History of Beekeeping and Honey Hunting* (Duckworth, 1999). Edition 2.

Dams, M. and Dams, L. R. (1977) *Spanish art rock depicting honey gathering during the Mesolithic.* Nature 268, 228–230.

Forbes (2019). *The Value of Pollinators to The Ecosystem and our Economy. Bayer Contributor.* Available at: **https://www.forbes.com/sites/bayer/2019/10/14/the-value-of-pollinators-to-theecosystem-and-our-economy/?sh=5962990b7a1d**. Accessed 08, December, 2020.

KLUSER, S., Neumann, P., Chazat, M-P. and Jefferey, P. 2010 *Global honey bee colony disorders and other threats to insect pollinators.* Environmental Alert Bulletins. Available at **http://archiveouverte.unige.ch/unige:32251**. Accessed 08, Dec, 2020.

Le Conte, Y. and Navajas, M. (2008) *Climate change: impact on honey bee populations and diseases.* Rev. sci. tech. Off. int. Epiz., 2008, 27 (2), 499-510

Lemelin, R.H., Dampier, J., Harper, R., Bowles, R. and Balika, D. (2017) *Perceptions of Insects: A Visual Analysis.* Society and Animals:1-20. **DOI: 10.1163/15685306-12341469**

Neumann, P. and Carreck, N.L. (2010) *Honey bee colony losses: Guest Editorial.* Journal of Apicultural

Research 49(1): 1-6. **DOI 10.3896/IBRA.1.49.1.01**

Planet Bee Foundation. (2017) Available at: **https://www.planetbee.org/planet-bee-blog//thesacred-bee-bees-in-ancient-egypt**. Accessed 08, December, 2020.

Prager, K. (2012) *Understanding behaviour change: How to apply theories of behaviour change to SEWeb and related public engagement activities.* A report for SEWeb LIFE10 ENV-UK-000182, May 2012.

Roffet-Salque, M., Regert, M., Evershed, R. *et al.* (2015) *Widespread exploitation of the honeybee by early Neolithic farmers. Nature* 527, 226–230. **https://doi.org/10.1038/nature15757**

Schönfelder, M.L. and Bogner, F.X. (2017) Individual perception of bees: Between perceived danger and willingness to protect. PLoS ONE 12 (6): e0180168. **https://doi.org/10.1371/journal.pone.0180168**

Serpell, J.A. (2004) *Factors influencing human attitudes to animals and their welfare.* Animal Welfare 2004, 13:S145-151. ISSN 0962-7286.

Statista. (2020) Available at: **https://www.statista.com/topics/5090/honey-market-worldwide/**. Accessed 08, December, 2020.

Szucs, E., Geers, R., Jezierski, T., Sossidou, E.N. and Broom, D.M. (2012) Animal Welfare in Different

Human Cultures, Traditions and Religious Faiths. Asian-Aust. J. Anim. Sci. Vol. 25, No. 11 : 1499-1506

November 2012 **http://dx.doi.org/10.5713/ajas.2012.r.02**

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Twenty stalls in the main barn and hay barn.

Beeyard some distance from the horses.

Honey bees and horses are a unique pairing. They can coexist under the correct circumstances. The colonies need to be placed such that when the bees fly, they fly away from any pastures and are close to a water source; closer than the horses' water trough. A sign indicating where the honey bees' hives are located should be installed so the humans who work with the horses know!

The colonies should be located at least 20 to 30 feet away from pastures and at least that distance where people ride and board their horses. A hedge or fence can be placed in front of the colonies to force the bees to fly up above the horse's heads and rider head level. Hives should not be located in pastures where there are horses. The horses will knock the hives over, resulting in angry bees and possibly injured horses.

Three Fox Farm (**http://threefoxfarm.net/**) is a full-service hunter/jumper facility located in Blythewood, South Carolina. They offer boarding, lessons, showing, and training. They show on the South Carolina Hunter

Horses drinking from their water trough.

Jumper Association (SCHJA), Blue Ridge Hunter Jumper Association (BRHJA), Progressive Show Jumping (PSJ) circuits, and at "AA" rated shows. Three Fox Farm also coaches the University of South Carolina IHSA Equestrian Team; they were Regional Reserve Champions for 2020!

Also, just as important, the bees' water source should be closer than the horses' water trough. Bees will line up around the trough water edges to gather water and sting the horses. If the bees start going to the water troughs, the colonies may need to be moved. This has only been an issue when the temperature gets into the upper 90°F. to low 100°F. in the Columbia, SC, area.

Swarming should be controlled as much as possible. Swarms emitting from hives can disrupt life on the farm. The colonies should be inspected weekly during the active swarm season. The active swarm season in the Blythewood, South Carolina, area is from the end of February through about the end of June. Five-frame nucleus colonies (NUCs) will swarm more and easier than eight-frame colonies with 10-frame colonies tending to swarm later and less often.

Swarm settling into new home. (photo by Susan Jones)

Care should also be taken during the honey harvest. Bees tend to get "excited" when removed from honey

Swarm cells protruding from bottom of a frame. (photo by Kathy Carpineto)

Opening hive to pull a super of honey.

Brushing straggler bees. Note how many bees are flying.

Full honey supers on their way to be extracted.

supers. Honey should be harvested on a warm good weather day and when there are very few horse riders and little farm activity.

Honey bees and horses can co-exist under the correct circumstances. In the case of Three Fox Farm, we ended up moving the hives due to the bees gathering water from the horses' troughs on very hot days. We were not able to locate the colonies closer to another water source than the troughs. Additional key issues are locating the colonies far enough away that during swarming and honey removal the bees do not disrupt life on the farm. BC

David MacFawn is an Eastern Apiculture Society Master Beekeeper and a North Carolina Master Craftsman beekeeper living in the Columbia, South Carolina, area. He is the author of three books, Applied Beekeeping in the United States by David MacFawn, published by Outskirts Press ***https://outskirtspress.com/***

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Beekeeping As A Healing Intervention

Sharon **Nighorn Schmidt**

Beekeeping for wellness has recently come to the fore as a way of helping people to defeat Post Traumatic Stress Disorder (PTSD), Depression and Anxiety. However, using peoples' interests in other living creatures as motivation in complementary and adjunctive mental health therapies is not new. Many books and articles describe the therapeutic value of working with animals that require training and/or care for the purpose of enhancing and enriching cognitive and emotional change in people experiencing challenges. But, just as there are similarities, there are also very specific differences between caring for or training individual animals and the techniques of animal husbandry and the relatedness required by a colony of bees, a super-organism; a society unto themselves.

Proposed mechanisms of action

As with any healing intervention, the mechanism of action which produces the observed result is of interest. Historically it is not unusual to use health interventions that work but about which we do not have enough information to be precise about why they work. An example is talk therapy which works for about a third of the population of consumers. The way in which it works is not precisely known and varies according to theoreticians.

Although we usually think of elements like an improvement in social ties caused by working with other beekeepers - or a sense of competence - or improvement in focused attention forged by beekeeping as being helpful, maybe even more is occurring in the human-insect interaction with bees than can be accounted for by those factors.

In 1996 neuroscientists Gallese, V., Fadiga, L., Fogassi, L., and Rizzolatti used electrodes placed in the premotor cortex of macaque monkeys to study neurons specialized for the control of hand and mouth actions and recorded electrical signals from a group of neurons in the monkey's brain while the monkey was allowed to reach for pieces of food. Having learned which neurons responded to the food stimulus, they found out that those neurons fired not only when the monkey was allowed to pick up the food but that some of the neurons would respond when the monkey simply observed a human pick up the piece of food as well. The neurons involved in this sympathetic phenomena were dubbed "mirror neurons." Thus, we can say that not only might mirror neurons explain empathic reactions but that those reactions may occur between living organisms, at least in primates.

This is mirroring by the biggest bee I know.

Beekeeping as a healing intervention implies that something within the individual has become disorganized and that participants are engaging in remediating mental health problems or problems in living. In Post Traumatic Stress Disorder (PTSD) the etiology of the disruption is clear; the individual dealt with a trauma perceived by them as life threatening. As a result, one of tne of the affected structures in the brain (the hypothalamus) becomes impaired and affects the capacity of the individual to integrate new learning and go on as usual. The disorder is bimodal and characterized by periods of over and under-arousal. In depression, the development is not always clear but the disorder involves the near-constant experience that one's circumstances are horribly bad and overwhelming, that they will continue to be overwhelming forever and that one is powerless to do anything about it. In clinically significant anxiety, the experience of being under constant threat, of feeling worried, vulnerable and exposed may bring about the most exquisite sense of panic, being unable to think straight, cope or even breathe. In short, in clinically significant illnesses, insults to the mind and body impose disorganization of thought emotion and function.

Beekeeping involves the exposure of the participant to 30,000 to 60,000 tiny individuals engaged in highly sophisticated, organized activity. The question is whether corresponding neurons "light up" in the brain of the participant beekeeper; a "Mirror Neuron Activation" effect; and whether that activity enhances neuronal re-organization in debilitated or disorganized individuals. This leads to the question of whether cross-species activity recognition naturally occurs between very different species, in this case specifically human/insect.

Although there is no specific data about human/insect recognition, the study by Gallese, et al (1996) cited above implies recognition by monkeys of the implication of a food related activity carried out by humans. It is a great deal more difficult to get willing humans to allow electrodes to be implanted in their brains, therefore it may be a long time before we can be certain of mirror

neuron activation as a mechanism of action in human/insect interactions but it is worth hypothesizing that this might have something to do with therapeutic experiences in beekeeping.

A second proposed mechanism of action that could fall under the rubric of "Exposure to Nature" perhaps under a heading such as "Microbiological Influence" is exposure to beneficial bacteria. In 1989 when David Strachan first proposed the "Hygiene Hypothesis", he postulated that lack of exposure to disease-causing bacteria during childhood might be responsible for immune inadequacy as an adult which was showing up as allergies and asthma. However, it is also arguable that lack of exposure to beneficial bacteria contributes to mental health problems.

Even as the role of inflammation was unfolding as a contributing or even causal factor in mental illness, the role of beneficial bacteria advanced by Christopher Lowry has gathered more substance. Results of experiments by his team indicated that the novel lipid, or fatty acid, called 10(Z)-hexadecenoic acid found in Mycobacterium vaccae in soil inhibits pathways that drive inflammatory responses. At this time, heat-inactivated M. vaccae is already licensed as an immunotherapy in China and has been evaluated as a vaccination for TB showing a robust response in mice (Gong, W., Liang, Y., Ling, Y. et al (2020). We hypothesize that exposure to the bacteria in soil may have a positive effect and may therefore contribute to wellbeing.

Conclusions and future directions

A review of the literature indicates that explanations for positive healing outcomes for beekeepers exist but none of them involve an explanation of the direct, biological effect of the hive or nature.

This paper offers a proposed mechanism of action for some of the positive changes reported among people who participate in Beekeeping for healing. It suggests that in addition to intra and intrapersonal factors, perceived healing may be related to 1) factors in nature such as beneficial microbes found in soil and 2) the nature of the beehive-human interaction which may exert a therapeutic effect due to the engagement of mirror neurons. These hypotheses are among many that might form a basis for research in this data-rich field. BC

References

Gallese, V., Fadiga, L., Fogassi, L., & Rizzolatti, G. (1996). *Action recognition in the premotor cortex.* Brain : a journal of neurology, 119 (Pt 2), 593–609. **https://doi.org/10.1093/brain/119.2.593**. Accessed online on August 12, 2020

Gong, W., Liang, Y., Ling, Y. et al.(2020). *Effects of Mycobacterium vaccae vaccine in a mouse model of tuberculosis: protective action and differentially expressed genes.* Military Med Res 7, 25 **https://doi.org/10.1186/s40779-020-00258-4**

Lowry, C.A, Hollis, J.H, De Vries, A, Pan, B, Brunet, L.R, Hunt, J.R.F, . . . Lightman, S.L. (2007). *Identification of an immune-responsive mesolimbocortical serotonergic system*: Potential role in regulation of emotional behavior. Neuroscience, 146(2), 756-772.

Smith, David G., Martinelli, Roberta, Besra, Gurdyal S. Illarionov, Petr A., Szatmari, Istvan, Brazda, Peter, Allen, Mary A., Xu, Wenqing, Wang,Wenqing, Nagy, László, Dowell, Robin D., Rook, Graham A. W., Brunet, Laura R., Lowry, Christopher A. (2019). *Identification and characterization of a novel anti-inflammatory lipid isolated from Mycobacterium vaccae, a soil-derived bacterium with immunoregulatory and stress resilience properties.* Psychopharmacology, **DOI: 10.1007/s00213-019-05253-9** Accessed online August 25, 2020 at: **https://um-primo.hosted.exlibrisgroup.com/permalink/f/1a4m872/TN_cdi_ucl_eprints_oai_eprints_ucl_ac_uk_OAI2_10095411**

White, Nicole C, Reid, Connor, & Welsh, Timothy N. (2014). *Responses of the human motor system to observing actions across species: A transcranial magnetic stimulation study.* Brain and Cognition, 92, 11-18. Accessed online July 20, 2020 at: **https://um-primo.hosted.exlibrisgroup.com/permalink/f/1a4m872/TN_cdi_gale_infotracacademiconefile_A393156946**

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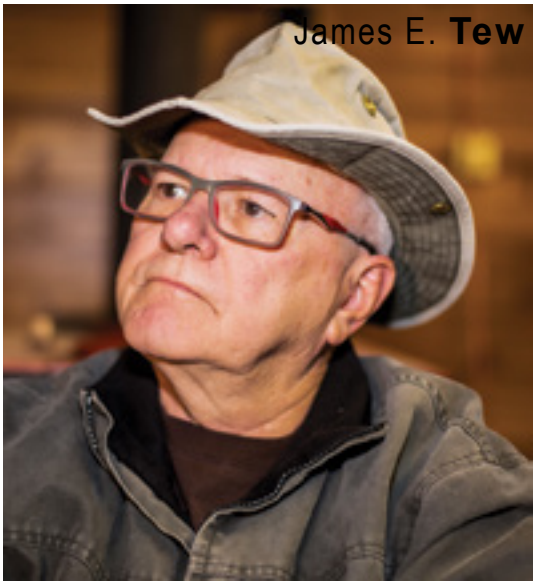
The Rational World Of Robber Bees

It's a problem because we say it is

Bee colonies robbing each other is a problem because we – as concerned beekeepers – say it is. And beekeepers say it's a problem because apiary bees become defensive (and aggressive) within the area and secondly, weaker colonies can actually be robbed to death. These common beeyard results are not good – at least not for the beekeeper.

In some way, it would seem that the negligent beekeeper should have done something to forestall this rampant behavior. Admonishments to address honey bee robbing are in every basic beekeeping book – every last one of them. Things to do and things never to do, that control or prevent robbing are presented in concrete fashion. It's like, "Here's the problem," and "Here's the answer." Advice from others free flows. Dealing with robber bees is an old and common apiary concern.

From another view, criminal bees seem perfectly happy to pillage the area. If entire book sections and years and years of advice abound, why do bees still perform the behavior so readily and so predictably? Clearly, there is some advantage for the bullish colony to forcibly take all the resources from a sad colony neighbor. There must be profits for the aggressor colony. To beekeepers, the activity appears to be *criminality* in the natural bee world, but to foragers, it's all in a day's productive work.



In his chapter in *The Hive and the Honey Bee*[1], Dr. Norm Gary wrote, *"Robbing behavior is, unfortunately, an anthropomorphic description of a special foraging behavior in which bees collect nectar and honey at hives or on unprotected combs of honey rather than foraging on flowers."*

I guess it could be said that Mother Nature is frequently not loving and nurturing. For instance, in an unforgiving world, I established two hypothetical colonies. One developed a large, healthy population and has hoarded surplus stores. It has done well during the season just past. It's near colony neighbor, didn't do as well. The reasons are irrelevant. Given the same environmental benefits, one colony did better than the other. One had a greater population than the other and more food reserves. That's *all* that matters.

For honey bees in general, what would be a better survival scheme? To have one "good" colony and one "okay" colony try to survive the winter or to combine them and have one "great" colony try to get through the upcoming Winter?

Enter the beekeeper

The beekeeper has invested money and time in both colonies. They will try to subsidize colony food reserves and possibly feed both colonies to get them through the Winter. It's what we beekeepers do. We have two expensive queens – true fact that one must be better than the other – and we bought two packages (more money), and too often, overall hive numbers are an indicator of our beekeeper value. Somehow, it would appear that the more hives a keeper has, the greater the level of competence. Not necessarily, but that is a story for another time. Bottom beekeeper line? We would want *both* colonies to survive. To the beekeeper, it would seem that two colonies are better than one.

Nature's opposing view

The biggest challenge a bee colony faces in a temperate climate is the long, foodless Winter period. Without enough food reserves, all the good health, great queens, genetics, Winter packing, and hive ventilation is for naught. Without adequate food reserves, the wintering colony will starve before Spring.

As the Autumn nectar flow wanes, and all flowering resources have been exploited to all profitable degrees, then the primary foraging source becomes the honey reserves in neighboring colonies. If the neighboring colony is not strong enough to defend its stores, then it most likely was not strong enough to survive the Winter. As Dr. Gary wrote in the reference presented about robber bees, they are not criminals so much as they are relentless foragers – even if it means foraging in their neighboring colony's pantry.

Robbing is more than a simple beekeeper inconvenience

Online, it is essentially impossible to uncover academic information about the biology and ecology of robbing behavior. Hundreds of listings immediately present generalized robbing control methods with time-honored recommendations. Don't have colonies too close together. Reduce entrances. Don't open colonies during a dearth. Don't leave comb scraps exposed. If you have managed bee colonies more than a full year, you have read the generalized recommendations. There is nothing wrong with this advice. No harm done. But know this, bee colonies will rob each other, and they will do it every season. The only

[1]Gary, Norm. 2015. 'Activities and Behavior of Honey Bees.' In J. Graham, (ed.), The Hive and the Honey Bee, Dadant & Sons, Hamilton, IL. pp. 290-291

way to completely eliminate robbing behavior is tremendously reduce colony density. In a robber-free world, a colony would have no near bee neighbors.

Robbing behavior is more than unemployed foragers, rife with frustration and boredom, searching anywhere and everywhere for food in any form. Colony foragers are aggressively competing with foragers from other colonies – in a life and death arena.

I have taken the following insert[2], verbatim from Wikipedia.

"In **ecology**, **scramble competition** (or **complete symmetric competition**) refers to a situation in which a resource is accessible to all **competitors** (that is, it is not monopolizable by an individual or group). However, since the particular resource is usually finite, scramble competition may lead to decreased **survival rates** for all competitors if the resource is used to its **carrying capacity**. Scramble competition is also defined as "[a] **finite resource** [that] is shared equally amongst the competitors so that the quantity of food per individual declines with increasing **population density**". [1] A further description of scramble competition is "competition for a resource that is inadequate for the needs of all, but which is partitioned equally among contestants, so that no competitor obtains the amount it needs and all would die in extreme cases."

Robbing seems to be a form of Scramble Competition – at first

For bee foragers, it's a timed game. The clock is operated by the nectar flow. While the flow is ongoing, each colony forager maniacally gathers whatever she can bring back to the colony's storeroom. At this point, I simply cannot get off the subject of this article, but R. Page, in his book, *"The Art of the Bee*[3]*,"* reveals that not all foragers are out for the biggest bang for their buck. While most foragers are going for the maximum load, some scouts are searching for alternative sources that

Are these bees foragers or thieves?

are sometimes lesser food producers than what is presently available to the colony. So much as possible, no food source (blossom or otherwise) is ignored, but it would be wrong to let the reader think that during good nectar and pollen flow times, all foragers come back fully ladened. As Page discusses, foraging decision-making is a complex issue.

What about Contest Competition?

Does robbing behavior shift to Contest Competition as the season progresses? So hypothetically, all foragers are out on the game field, being as successful as possible and the game clock, the nectar flow, runs out. The ending bell, the first frost of early Winter, sounds and floral foraging comes to an end. Commonly, food dearths occur in mid-Summer or during Winter. Flowers are no longer producing food rewards. That is when I suggest that the second type of interspecific competition comes into play – Contest Competition. ***Contest competition***[4] *is a form of competition where there is a winner and a loser and where resources can be attained completely or not at all.* This is the case of the robber and the hive being robbed – one winner and one loser.

Though nectar sources have finished flowering, the weather is still warm enough for bee flight. Experienced foragers are still on the job, but no sources are out there. Robbing conditions are at hand. Beekeepers know that this is the time that colonies begin to attack each other. That some colonies survive the Winter is paramount to the survival of the species. If one wants to see the concept of *"Survival of the fittest"* in play, just watch the pandemonium that robbing causes within the apiary.

Pure frenzy

Historically, still photos have been presented to show events that really couldn't be shown in a still photo. The wonderment of watching a bee dance is completely lost in a still photo. I write about a dozen articles a year asking what washboard movement is showing. A still photo does not capture the washboard behavior movement. Until you see hundreds of bees performing the rhythmic motion of the unexplained behavior, a beekeeper cannot grasp the event.

Robbing frenzy is one of those bee behavioral events that is poorly captured by still photography. Look at my short clip at:

or look at any other bee robbing clip on the web. True chaos. Pure frenzy. To fully appreciate, you simply must see and hear the hellish event. I don't have words and terms to express what a full-featured robbing event looks and sounds like.

[2] https://en.wikipedia.org/wiki/Scramble_competition#cite_note-DenBerg-1

[3] Page, Robert E., Jr. 2020. The Art of the Bee, Shaping the Environment from Landscapes to Societies. Oxford University Press. 239pp

[4] https://en.wikipedia.org/wiki/Scramble_competition#cite_note-DenBerg-1

I get it – as best I can

Okay. In some fashion, using some rational foraging plan, bees have "scrambled" to garner what they could from flowering plants in their immediate ecosystem. That aspect of the season ending, foragers moved to some other type of non-blossom foraging paradigm – maybe contest competition. Winner take all. It's a brutal, unfair world out there for bees. Even so, I cannot explain the electric frenzy that pervades my apiary when robbing is in play. The whole area, far beyond my beeyard, is energized. I feel an odd urge to type my comments here in upper case and bolded. These bees are absolutely ***nutso***. Absolutely.

We are part of the problem

This is one of my guesses. The insanity shown by robbing bees can only be due to the unnatural positioning of numerous colonies near each other. As beekeepers we do that and call the assemblage an "apiary." There are no natural apiaries in the wild. If I may be blunt, can I say that overall, while great for the beekeeper, I sense that an apiary is not a good thing for bees. It's where beekeepers concentrate bee diseases, suppress natural swarming, violate brood nest sanctity, entice animal pests, and yes, set the groundwork for massive robbing behavior.

As has become my style, without a shred of original data and without an adequate literature search, I speculate that robbing behavior commonly occurs in nature, but with much less fanfare and commotion. Natural nests are spaced far apart – not just a few meters, and populations are much smaller. Mortal battles are fought, won, and lost. But all of this is out of sight from the prying beekeeper. Resources are reapportioned and a natural nest cavity is made ready for a replacement swarm next spring. Importantly, population dynamics are adjusted to reflect the current carrying capacity of the immediate ecosystem.

I am speculating

Robbing is not simply an inconvenience for beekeepers who are trying to maintain colony numbers. Robbing is a population adjustment strategy that reallocates valuable resources to colonies better suited for seasonal survival. Essentially, the colonies with the best chance for survival get the food reserves of those with a lesser chance of Winter survival.

I speculate even more

In my beeyard, I would guess that as the flowering season comes to an end, some behavioral shift occurs in foragers. Rather than witnessing recruitment dances and learning flowers, foragers seem to broaden their search parameters to anything that smells and tastes of carbohydrates. I would guess, that within my beeyard, there is a general mingling of foragers from colonies that are testing neighboring colonies. If a colony is able to rebuff exploratory robbers, they protect their resources and their scouts possibly find a colony that is having difficulty protecting whatever it has. I suppose I am writing, that during robbing periods, probably all colonies are explored for possible robbing targets, but some are able to resist. Others can't withstand the onslaught.

But I am at a loss to suggest a way that other robbing foragers are recruited to the newly found weak colony. Ribbands[5] said that robbers were using odor cues to find robbing sources and entrances. I don't doubt that observation, but does it feel a bit inadequate? Why the raging confusion and how are recruits finding the victim source? In the same beeyard, recruitment dances would be generalized. What's new about the odors. These odors have been there all season long. During robbing periods, what's different that lets bee sister turn on bee sister so aggressively?

There is one thing . . .

There is one visible characteristic of robbing bees – their erratic, jerky flight. It has long been reported that bees develop that personality because they have been accosted by innumerable guard bees. In some cases, even their thoracic hair has been rubbed away. But just let me ask, *"Is it possible that the erratic flight behavior of robbers is a cue for enticing robber recruits to a beleaguered colony?"* I am not strongly bonded with my own question. But I am bonded with this notion – there is something different in a beeyard that is attacking and being attacked by robbers. Everywhere this energy, this franticness is exhibited. What bee yard characteristics changed?

I'm not finished...

I am not finished, but my monthly space allocation is filled. In a companion article within a few months, I would like to contribute robbing comments on entrance restrictions, robbing cages, robber behavior and other beekeeper procedures. I hope you don't mind. Obviously, I have this bee behavior on my mind.

To be crystal clear

I want to be perfectly clear that the citation I posted concerning Scramble and Contest Competition is not my written work. I copied it and then cited it in the URL presented in footnotes. This is the first time I have used a citation that had other URLs embedded. I want to be sure I am crediting the original authors in a proper way.

Thank you.

As always, I appreciate you reading my rambling comments. Readers are a great thing for any writer. Thank you. BC

Dr. James E. Tew, Emeritus, Faculty, Entomology, The Ohio State University and One Tew Bee, LLC; **tewbee2@gmail.com; http://www.onetew.com**

https://youtu.be/aL3fxfHQQqQ

[5]Ribbands, Ronald. 1953. The Behavior and Social Life of Honey Bees. Dover Publications, Inc. 920 Broadway, New York, NY. 352pp

GLEANINGS

FEBRUARY 2021 • ALL THE NEWS THAT FITS

OBITUARIES

Curtis (Pete) Eugene Meier, of Paris, Texas passed away December 11, 2020, at Paris Regional Hospital.

Curtis was nine days from celebrating his 90th birthday.

Curtis was well known in the beekeeping industry with many great friends and customers. He began his passion for beekeeping as a child.

After working 10 years for the railroad in Taylor, Texas, he moved his young family to Paris and began working as a branch manager for Dadant & Sons Bee Supply Company. He serviced beekeepers throughout Texas and the adjoining states and was often invited to speak at conferences. He loved working for Dadant and retired in 2004.

While working at Dadant, he built his own beekeeping company with thousands of hives scattered throughout Texas. In 1985 he was awarded Texas Beekeeper of the Year by the Texas Beekeepers Association. In 2004, he was recognized for his contributions to the beekeeping industry from 1958 to 2004.

Curtis loved the outdoors and took his family on camping vacations to Arkansas every year. His favorite hobbies included traveling, golf, barbecuing, fishing, bird hunting and deer hunting.

He built a ranch in Mason, Texas with his older brother Fritz. He treasured and shared the ranch with his family and many friends. The annual Thanksgiving gathering was a cherished time for him with his family. He loved the serenity of the hill country and the view while sitting on the porch in the morning and evening. He would still make the six plus hour drive at the age of 89 (even alone) just to spend time there.

Curtis was baptized and confirmed at the St. Paul Lutheran Church in Taylor, Texas. He belonged to Beautiful Savior Lutheran Church in Paris.

Curtis was preceded in death by his parents, Edwin and Lena Meier; his wife and the mother of his children, Joyce Meier; his wife, Deana Settles; and his six siblings.

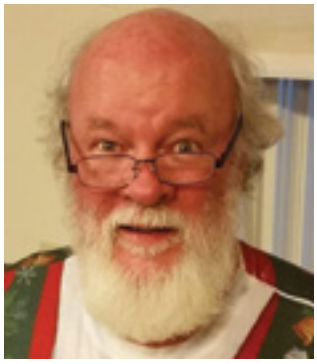
Curtis is survived by his wife, DeEtte Cobb Meier; and his children, Vickie Noles, Kathie Woodard and husband, Randy, Russell Meier and wife, Delloise. Also his grandchildren, Aimee Cobey and husband, Stephen, Chris Noles and wife, Becky, Kim Adams and husband, Rich, Ryan Nelson, Britney DiFulgentiz and husband, Bobby, Chase Woodard and Jodie Edelhauser, Chance Woodard and Austin Meier; 14 great-grandchildren. He is also survived by DeEtte's children, Carla and Bill Coleman, Missy and Joe Cobb, Margaret and Robert Cobb, Deanna and Richard Cobb and their children and grandchildren, all of whom loved Curtis very much.

Aaron W. Morris, Round Lake, NY. The Bee Man has passed. Aaron W. Morris, 66, passed away on Sunday, January 3, 2021, at his home surrounded by his family.

He was born in Saratoga Springs and was a 1972 graduate of Shenendehowa Central Schools and a graduate of SUNY Albany majoring in mathematics/computer science, class of 1981. Aaron was one of the first computer specialists working at SUNY Albany, retiring in 2011.

A world renown master beekeeper, Aaron was former president of the Empire State Beekeepers Association. He taught many beekeeping classes throughout the northeast including Cornell University. He was a member of Empire State Honey Producers, and the Southern Adirondack Beekeepers Association, holding numerous positions. He was also master beekeeper of the Eastern Agricultural Society. He attended several international beekeeping conferences as a special invited guest and speaker.

Aaron received multiple awards for his honey, beeswax, and candle making. Aaron enjoyed all aspects of gardening, including special gardens for bees, butterflies and birds. He especially enjoyed the company of family, friends, and his adopted second family, the residents of the



Village of Round Lake.

He was predeceased by his father Ellis F. Morris Sr. and his mother and stepfather Barbara Morris Lucarelli and Frank Lucarelli. Aaron is survived by his brothers, Ellis Morris (Valerie) and Ross Morris (Edie); sister Daryl Morris Griffiths (Tim); and his loving friend Julia Corbally-Carson. He was a special uncle of Michael, Samantha, Elizabeth (Travis), Luke, Leora (Haylee), and Livia; and great-uncle of Dylan, Charlotte, and Theo. They lovingly called him Uncle Beezer.

A celebration of Aaron's life will be held on a later date. Memorial contributions in memory of Aaron may be made to the Fund for the Preservation of the Round Lake Auditorium and Organ, c/o AP3, P.O. Box 546, Round Lake, NY, 12151.

CALENDAR

♦ALABAMA♦

The 26th Annual Alabama Beekeeping Symposium is going digital on February 6-7. Because of COVID-19 restrictions participants will be able to attend from the comfort of their own home.

The cost is $20 and you can register and get more details at **https://www.aces.edu/blog/topics/lawn-garden/alabama-beekeeping-symposium**/.

♦KANSAS♦

Spring 2021 Virtual Kansas Honey Producers Meeting March 6.

Guest speakers include Samuel Ramsey and Clarence Collison. You must register to have the zoom link emailed to you.

To register and for more information please visit **www.kansashoneyproducers.org**.

♦MICHIGAN♦

MI Beekeepers Association Spring Conference will be held March 3-6.

Speakers include Samuel Ramsey, Tammy Horn Potter, Juliana Rangel Posada, Meghan Milbrath, Roger Hoopinarner, Julia Mahood, Peggy Garnes and Dorothy Morgan. Workshops for the whole family.

For more information please visit **http://michigan-bees.org**.

♦NEVADA♦

Nevada State Beekeeperes will hold their conference February 26-27 in Yerington.

There will be speakers, hands on workshops, honey tasting, photo contest, banquest and more.

For information contact **NevadaStateBeekeepers.org**.

♦OHIO♦

Lorain County Beekeepers Association will hold their annual Beginner Beekeeping Class on Fridays in March beginning March 5, at Life Church, 1033 Elm Street, Grafton.

The fee is $50 which includes 1 year membership to the club.

Hands-On Field Day will be held June 5 at Queen Right Colonies, 43655 State Route 162, Spencer, OH. **Bonus Class - Fall Wrap** September 10, 7:00 p.m. at Life Church.

For information visit **www.loraincountybeekeepers.org**.

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Cold weather doesn't kill bees. Varroa mites kill bees. I live by this.

It's early December as I write. Lately our western Colorado overnight lows have hit the teens, with daytime highs in the upper 40s. My queens are mostly shut down, and next week's forecast is for 10-15 degrees colder. It's time to treat my 70 colonies with an oxalic acid dribble, for *Varroa* mite control. An oxalic dribble on brood-less colonies is hell on mites, relatively easy on bees, and gives me confidence I'll have very low *Varroa* numbers going into Spring.

To make an oxalic acid solution, you need an accurate scale that measures in grams. Just as I was about to inquire where ours was, the gal Marilyn blurted out, "I think a meth head stole my scales at the farmer's market in Montrose!" This is rural Colorado, and yes, we have our problems.

Tina thinks I'm off my rocker, but she's very nice about it. She argues that we should only in the most dire of situations break the insulating propolis seals that bees create between hive parts, like brood supers and inner covers. She says our little darlings could catch a chill. Rather than dribble with a garden sprayer, she says I should use an oxalic acid vaporizer, so I don't have to break open my hives. I get what she's saying, but I don't own a vaporizer, and I'm not convinced they're as effective as the dribble. Tina also claims the dribble may disrupt the bees' gut biome. She may be right. I frankly have no idea. I only know it's December, and I have to do what I have to do.

Tina and I had this same conversation a year ago in November, when I got blindsided by large mite populations in some of my colonies. Hemmed in by a dismal weather forecast and some bee club commitments, I bundled up and broke a whole lot of propolis seals when I dribbled 80 colonies. Temps were in the high 30s.

I did not wrap these hives for our frosty Colorado Winter. I never do. They sat on the ground, not on hive stands. I partially duct-taped-shut the bottom entrances and put sheet-foam insulation or hive-top feeders under the hives' telescoping outer covers, to create dead air space. A dozen or so colonies with migratory lids received no such insulation. I didn't bother with mouse guards. When I tested In April I couldn't find a mite. Colony overwintering success was exceptional. Just how exceptional? I'm not going to say, because you'd call me a liar.

Paul didn't call me a liar, even though I did tell him a stretcher or two. We normally release the trout we catch, and we don't fish right next to each other, so we use the honor system when we brag. A few weeks ago, I said, "Paul, I landed a 20-inch brown," and he said, "That's great! I caught a 24-inch rainbow." I believe him! The week after that, when I reported a 22-inch brown, he never questioned my integrity. I based both of my measurements on the fact that I have a 10-inch outstretched hand span, so I can lay a fish out on the bank and make a quick estimate., before I return it to the river.

Except when I re-checked my hand span after the fact, it was only nine inches. When I confessed, "Paul, you need to knock two inches off both those big browns," he merely chuckled.

Exaggeration is such a part of fishing culture, it's considered normal and even appropriate. If you insist on the real truth, you need to subtract a fudge factor from any angler's measurement or weight estimate. I still think the tape measure on the outside of my canvas fish creel is a little over the top. It goes up to 16 inches, but when I laid a real tape measure next to it, the "16 inches" revealed itself to be a mere 14!

I leave any inevitable comparisons to modern-day politics and fake news to your fertile imagination.

On the drive home from last week's fishing expedition, Paul said he found Meghan Milbrath's *American Bee Journal* piece on paraffin-coating hive woodenware to be intriguing and maybe even practical. When I read it, it occurred to me you'd want very good insurance, and maybe a fire truck in the driveway. But Meghan has boundless energy and enthusiasm for bees and beekeeping, so I get it that she would attempt something as dicey as heating large vats of highly flammable paraffin to coat bee supers.

Meghan's leaving Michigan on Tuesday for a yearlong stint at the Swedish Agricultural University's honey bee lab, in Uppsala. Her focus: bee health. She got a scientific exception to the Covid ban on U.S. travelers, so now she'll live her honey bee dream under the midnight sun, or steaming in saunas and rolling in the snow like they do over there. She gets to bring Ben and both dogs.

Meghan's good fortune makes my heart sing, and I told her so. Faithful reader, do you want the answer to life's riddle? Do you want to know why you're here? I'm old, so I know all the answers. I'll tell you. Be like Meghan. Find your passion and pursue it. Never let up. That's all you need to know!

Ed **Colby**

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