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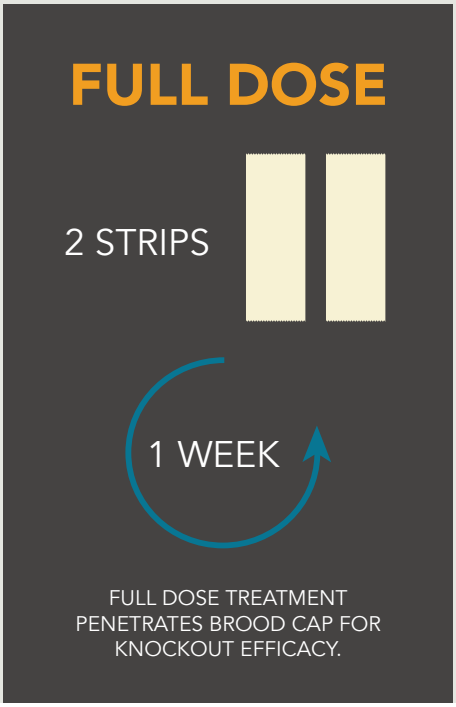

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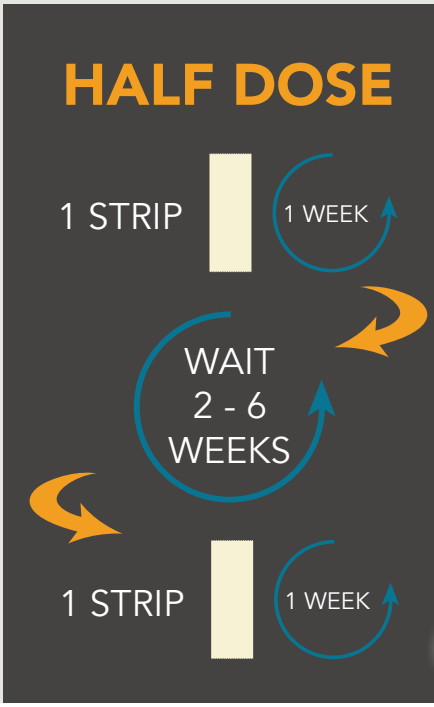

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Bee Culture

April Features . . .

This Year Marks the 10th Anniversary Of The Colony Loss Survey – Usually 10 year anniversaries are worth celebrating, but somehow this one is not. By most accounts it's been a rough 10 years, with many beekeepers losing unprecedented number of colonies. Our loss survey has been one of the only constant measures of colony health, highlighting the plight of honey bee colonies and the beekeepers who keep them. We at BIP want to thank all of the beekeepers who have participated. A special thanks to all those who have taken time out of their busy schedules to participate in the management survey we initiated 5 years ago. Now, with over 20,000 responses, we are able to develop data based management plans for beekeepers in different regions of the country. Stay tuned – we plan to release these detailed plans in the near future. But we still need your help, and so we hope you will take the time to complete this year's survey. Adding to our database only helps refine our management plans, so your participation is as important as ever. And then see **www.beeinformed.org** and **http://10.selectsurvey.net/beeinformed/TakeSuvey.aspx?SurveyID=BIP2016** and **http://honeybeehealthcoalition.org/varroa/**.

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Darrel Rufer in Full BIP garb. He works out of both TX and MN in honey production and queens.

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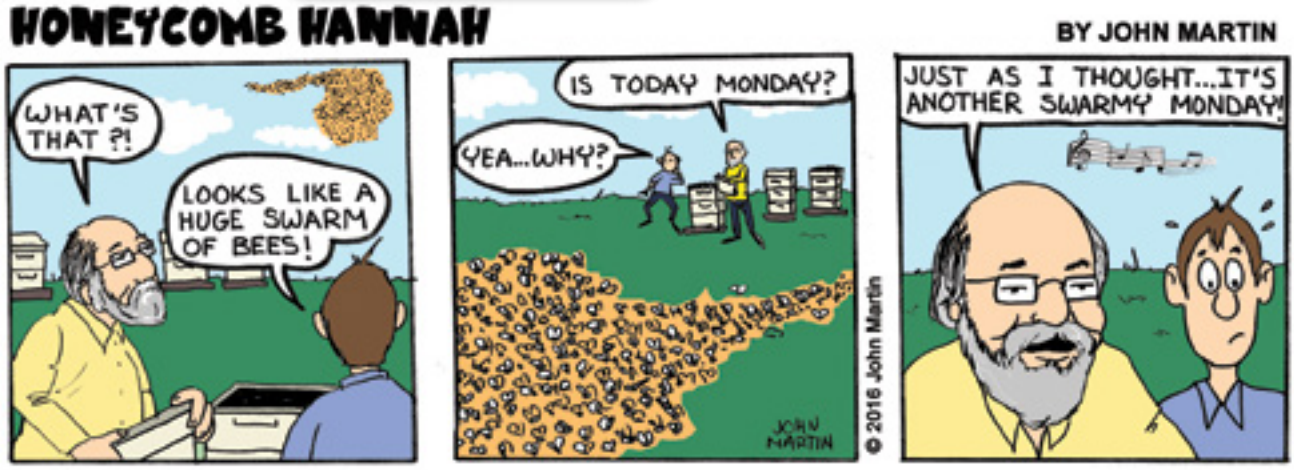

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Climate Change

When I began reading Ken Lawler's letter in the March issue taking Ross Conrad to task for his article discussing climate change, I enjoyed it immensely because I thought Mr. Lawler was doing a parody of the spittle-flecked rants of those who deny that human activity is causing catastrophic climate change. When I realized that he was actually serious, however, his letter was less entertaining despite his silly and trite references to Al Gore and spotted owls.

Why stop with letters denying human-caused climate change? Maybe *Bee Culture* should entertain letters from those who believe that the 9/11 attacks were a government conspiracy, that Barack Obama is not an American citizen, and that the government is about to confiscate all of our guns.

Tom Chester
Portland, OR

•

One of the features common to most climate change deniers is an overarching ability to ignore the volumes of well researched, data based, peer reviewed science that 95% of scientists say is incontrovertible and is readily available to anyone who wants to read it.

And heaven forbid that deniers like Ken Lawler (*BC*, March 2016) should actually cite scientific evidence to support their assertions, or choose to muddy the waters with facts. It's so much easier to attack personalities and to make vague, generalized assertions relating to thermometers on the roof, Neanderthals and black rocks, 'reported mile high glaciers' that have periodically covered the midwest (the last of which melted some 13,000 years ago) and churlish comments about windmills and spotted owls.

Climate change is denied primarily so that business and industry do not have to change the way they operate. They don't have to spend money to reduce emissions, toxins and pollutants, and it is easier to make a case for cutting taxes on the wealthy and corporations if we abrogate to the government our responsibility for taking action to save the planet.

If there is something we don't understand, or are too indolent to research, it is so much easier to deny it.

As an example, and according to an article in *The Guardian*, ExxonMobil, the world's biggest oil company, was aware as early as 1981 of the connection between fossil fuels and climate change, and the potential for carbon-cutting regulations that could hurt its bottom line, seven years before it became a public issue. Despite this, according to Greenpeace, the firm spent $30 million over the next 27 years to promote climate denial. Clearly there are some who still accept unquestioningly the propaganda distributed by these biostitutes.

And at a more individual level, recall the devious tactics indulged in by the tobacco industry to deny the relationship between smoking cigarettes and lung cancer, a ploy that failed as the average John and Jane Doe became better educated and voted with their feet and their wallets. Given the right information, the citizenry can make similar decisions about the factors causing climate change and the choices that each of us have to make a difference. Many great revolutions have come from below in the absence of leadership from above.

I for one have enjoyed and appreciated the series of articles that Ross Conrad has written about climate change. They are articulate, a cogent summary based on scientific data, and offer practical solutions for the beekeeper, unlike the letter writer cited above.

Ross concludes the third of his articles by suggesting that "... rather than invest in trying to protect the beekeeping industry by resisting disturbances, we might be better off investing in the knowledge and the assets that enhance the sustainability and resilience of U.S. beekeepers." I read this as a plea to move our focus from symptoms to the bigger underlying issue, which means in effect being willing to change both our behavior and our expectations.

Sadly some will be left behind, squirreled away in hearsay, emotion and self-delusion. I fervently wish

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climate change could be addressed with a united front but, for the sake of the precious organisms on which we depend, including the honey bee, we cannot allow willful ignorance to hold us back.

Jeremy Barnes
Seven Valleys, PA

Charles Mraz

In the March 2016 issue of *Bee Culture*, John J. Mckelvey, Jr. from New York makes the following comment about Charles Mraz of Middlebury in his letter regarding smokers"...arthritis ran him out of the beekeeping business before he died." Charles passed into spirit in 1999 at the age of 94 and is considered by many to be the father of American apitherapy and the use of bee venom for treating arthritis.

I worked with Charles and his son Bill from 1992-1998 and it is my experience that Charles did not have arthritis, nor did he ever get totally out of beekeeping. Granted he was in his late 80s and early 90s during this period and he didn't move as fast as he did when he was 40 but he was still quite active. I remember helping him collect honey bee venom to sell to pharmaceutical companies and assisting him getting his bees packed for Winter. I once had some extra time after a day of working bees, and I stopped by his house to check on the hives he kept out back to be sure he had them supered up for the honey flow. When I looked over at his house there was Charles fixing his roof with his cordless phone in one hand, and a hammer in the other hand. Never once during my years working at

Champlain Valley Apiaries did Charles mention, nor did I observe, any evidence of his suffering from arthritis. Just to be sure he didn't have arthritis I recently checked with several members of his family who all confirmed this. However, if Mr. Mckelvey has any evidence to back up his claim I hope he will contact me and share it. I have no wish to follow in the footsteps of so many climate change deniers who succumb to the condition described by psychologists as *confirmation bia*s. This condition is defined by wikipedia as "the tendency to search for, interpret, favor, and recall information in a way that confirms one's beliefs or hypotheses, while giving disproportionately less consideration to alternative possibilities."

Ross Conrad
Middlebury, VT

Using Starter Strips

Hi – I'm a subscriber to *Bee Culture* and wanted to send an email in response to the March 2016 'Ask Phil' article on using starter strips (the first article of this month's section).

Usually I'm on board with Phil's explanations and suggestions, but I couldn't disagree more on this topic. Last year was my first year beekeeping, and I did *exactly* what the gentleman writing said he wanted to do: use starter strips in all of his hives as opposed to using full sheets of foundation. In my first year, I had an overwhelming amount of success and did not experience any of the 'painstaking intervention' Phil references. I had two 'corrections' for the entire year (both from the same hive), but other than that, the bees drew straight comb from the starter strips throughout the frames. Phil's statement of 'alternating frames of foundation and frames with starter strips is unlikely to help, and might make things worse' is inaccurate. In fact, alternating starter strips and foundation in this way is a perfect method for ensuring the starter strip/foundationless frame is drawn evenly. I used this method when installing my five-frame nucs last spring, and within a few weeks I had perfectly drawn frames from thin air- straight as an arrow!

Not to mention, it's fascinating to witness each colony draw comb from nothing. Each colony has its own preferences as to which frames they prefer to draw out first, and their initial approaches for each frame even vary: some colonies are methodical drawing comb from top to bottom in a straight line, but other colonies create semi-circles of drawn comb within the frame, eventually combining the semi-circles to fill in the entire sheet. This observation alone was worth it for me, as dozens of honey bees could be seen hanging from a thin strip of comb-in-progress, all working together to perfectly design and engineer each frame. Of course, there are other desirable perks of a foundationless hive: less chemicals, cut honeycomb, the always fun 'crush and strain' extraction method, and the potential benefits of regressing bees to their more natural small-sized cells. I know seasoned beekeepers can be set in their ways, but it's essential we all keep open minds as we continue to try to improve the health of our bees. If you haven't had success using starter strips or going foundationless, I'd encourage you to make sure your hive is level (since the bees will draw comb straight down as gravity allows) and give it another shot. Better yet, don't use starter strips at all – just snap out the wedge strip on a new frame, turn it sideways, and nail it right back to the frame where it came from to create an 'edge' for the bees to begin drawing from.

When I excitedly picked up my first nucs last year, I told the head of my beekeepers association that I was planning on going foundationless. He adamantly advised me against this, and said foundationless hives would be too difficult to handle, especially for a first-timer. This set my excitement level back, but there were too many

success stories out there for me to scrap my plans. I went with my gut, gave foundationless a shot, and will never look back!

Chris Tesauro
Asheville, NC

Travel Notes

While I was reading Jessica Louque's Bigger Picture *BC* Jan 2016 I thought she was reading my mind. I couldn't agree with her more. I am reluctant to get in my car anymore than I have too for all the reasons she stated.

Bob Oneil
NY

Politics of Killing Bugs

Hello All — I have thought about the many responses I have received to the article, The Politics of Killing Bees. A key understanding for us all is the differences between adulterated and unadulterated bee forage. Chemical free forage is key to honeybee health. Honeybees choose to visit flowers based on their preferences and perceptions as evolved through thousands of years. In our world there are two choices; crops with chemical adulterations, and other plant choices, often non native invasives, which provide chemical free nutrition so critical for their survival and the survival of countless other insect pollinators.

The growth of non-native plants is an emotional trigger for some. There are beneficial non-natives, and non-natives that have no redemptive value (bittersweet, barberry as two examples). The decisions people make to suppress pollinator beneficial invasives are my concern. Nothing less. Honeybees have preferences, and it is those preferences that I address. People beings busily

destroy natural environments with pavement, altering drainage patterns, polluting water stores, using chemicals in agriculture, burying trash, but these actions we accept – and in an odd way, we believe that we, through our power & political hierarchies, get to set the rules about what lives and dies.

Katherine Kiefer
beesweet1@gmail.com

Questions and Answers

A hand mirror is a useful apiary tool. When held underneath a hive, the reflection quickly yields valuable information, especially in the winter when the hive cannot be examined.

Dead bees on the bottom board
Few or many?
Is the exit blocked?
Mold on the bees?
Moisture in the hive?
Need more ventilation?
How quickly do the bees clean out the dead?
Are these bees hygenic?
Is the colony too weak to clean it up?
What does the pattern of dead bees indicate?
Is the cluster the size of a softball or a volleyball?
Is there enough food stores for a large cluster?
Where is the cluster located in the hive?
Is there adequate food above the cluster?
Mouse droppings or nesting materials visible?
Snake?
Larvae?
Chalk mummies?
Crawling, trembling bees?

MORE HONEY LABELS

Last month in *Bee Culture* we gave you some ideas and information on how to make a good honey label and we showed you some samples that we received from readers. Well, we received a bunch more so here is a another look at what folks are doing with their labels to make their honey more attractive to the customer.

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Ruffsdale, PA

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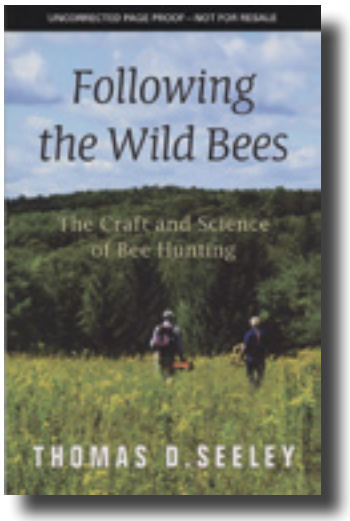


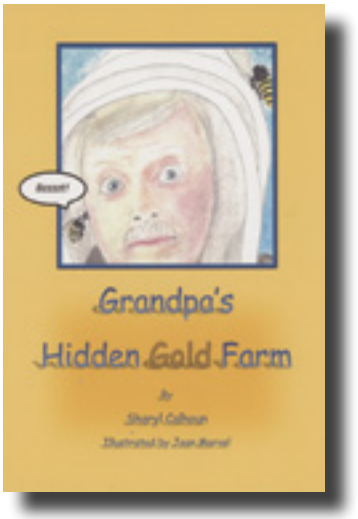
Following The Wild Bees. The Craft and Science of Bee Hunting. By Tom Seeley. Published by Princeton University Press. ISBN – 978-0-691-17026-8. 5.5" x 8.5". 192 pages, color, w/few B&W. Hardcover. $22.95.

I got a chance to read this a few months ago, with the promise not to tell anybody anything at all about it. The publishers wanted a few words and thought maybe I would have some insight the others they asked might not since I'm more in the beekeeping world than the rest. What an honor, and a challenge, what a book (though they didn't use my blurb, it was great to be asked).

Tom's new book is about beelining. Well, actually he uses beelining to teach a whole lot about honey bee behavior and biology. He does that a lot you know, but he does cover the basics – the box and tools you'll need, maps, compass, old comb, marking pens, syrup, toolbox, a stand for the box, and a comfortable chair to wait in. He uses a scent in his bait syrup, like anise, and flagging – landscape tape works well in my experience – easy to use, inexpensive and neon orange show well. You use that so you don't get lost.

So you catch a few bees in a flower patch, let them feast on the syrup in the box for a bit, let them move into the empty part of the box, mark them, and let them go – and see where they go. Then wait. You'll know when they come back because they're marked, and with lots of practice you'll know how far they are from your box because you timed them. Then you move down the line they followed when they left last time a bit, let them go again and follow the line. And it's not at all as simple as I've just described. There's the timing thing, and the change direction thing to avoid hills, and actually finding a hole in a tree 30 feet off the ground in the shade.

Tom makes it sound simple, but he's been doing it for years. When I started here I bought the remaining stock of an author's collection on bee hunting books and gave it a shot. I got kind of good – just kind of. But it gave me enough experience, and skill, to appreciate this book. If you haven't beelined yet, you're not a complete beekeeper. It's you against the bees, and they win more than not. Try it this Summer. Once again you'll find out how cool bees really are. – *Kim Flottum*

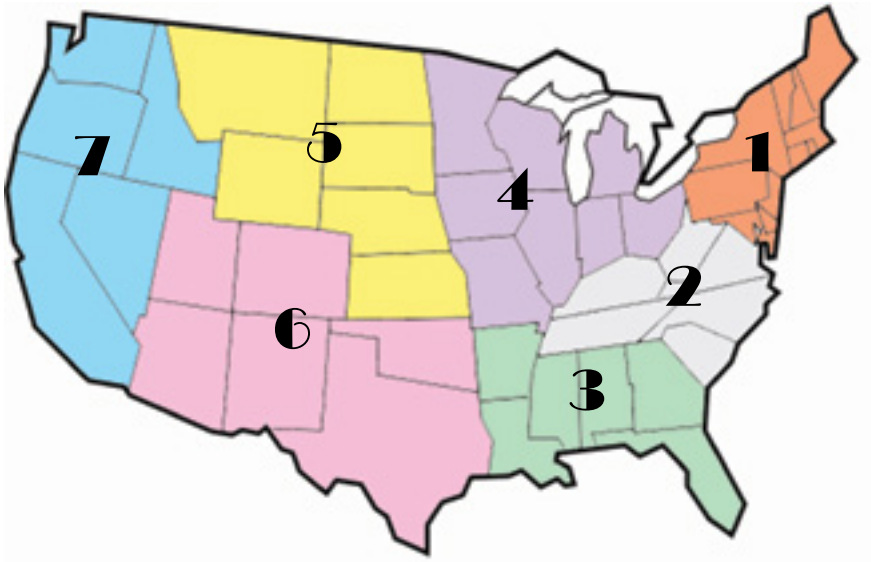


Grandpa's Hidden Gold Farm – written by Sharyl Calhoun and illustrated by Jean Marvel. This 28-page soft cover, all color book is for children PreK - Grade 2. Available at bee supply stores or at **www.grandpastree.com** for $7.99. Quantity discounts available.

The author of this exciting new children's book is a reading teacher and recalls watching her grandmother working her beehives. The story is written in rhyme and a clever, tiny bee guides one through the realistic fiction tale. It is a fun way to introduce the importance of beekeeping to our youngest generation.

The artwork is beautiful and in full color. And the book finishes up with two diagram – "Parts of a Hive" and "Bee Tools."

APRIL – REGIONAL HONEY PRICE REPORT



Overwintering Success

We polled our reporters this month to see what shape their bees were in at the beginning of March, and what they had done the previous fall and winter to prepare for the down season. So, across all regions, we'll begin with feeding, but for some of these the region makes a difference of course and we'll point that out. 31% didn't feed at all last fall, while 30% fed both carbs (sugar) and protein. 5% fed protein only and 34% fed sugar only. When asked about mite treatments, we found 24% didn't treat for mites at all, 22% used Apivar, 14% used oxalic acid as a drizzle or vapor, 21% used formic, 14% used Apiguard and 4% used other treatments (Hopguard, Checkmite, Apistan and the like).

When it came to protecting colonies from harsh winter weather certainly some regions don't bother. But those in the colder parts of the US think a bit differently. Region 1 just under half did some kind of wrap, and, actually across all regions that had wrapped colonies, it was exactly divided between roofing felt, sheets of insulation and the Bee Cozy wrap. Region 2 only 14% wrap, 3 none, 4 right at half, 5 30% wrap, a quarter in 6 and not surprisingly none in 7. Total, 23% wrap, 66% don't. Finally, over all regions, when they got to look in early spring, 30% had colonies in better condition than usual, 51% about average, 17% worse than average and 2% far worse.

	REPORTING REGIONS							SUMMARY			History	
	1	2	3	4	5	6	7				Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS								Range	Avg.	$/lb		
55 Gal. Drum, Light	1.95	2.11	2.26	2.55	2.10	2.13	2.50	1.65-3.10	2.24	2.24	2.22	2.26
55 Gal. Drum, Ambr	1.75	2.02	1.97	2.51	2.16	1.95	2.50	1.40-3.00	2.11	2.11	2.14	2.15
60# Light (retail)	220.71	175.40	192.50	206.75	171.00	189.25	256.67	135.00-300.00	203.88	3.40	203.68	203.12
60# Amber (retail)	223.13	175.42	181.67	201.54	206.31	186.20	256.67	123.00-300.00	201.12	3.35	205.40	198.34
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	96.64	74.95	77.43	62.25	51.84	87.45	110.00	48.00-240.00	84.97	7.08	81.16	75.83
1# 24/case	125.33	104.30	113.59	100.93	127.16	104.49	171.60	45.00-216.00	118.83	4.95	115.81	116.59
2# 12/case	118.45	93.00	108.55	95.11	97.44	95.83	124.50	70.00-192.00	108.33	4.51	104.07	100.17
12.oz. Plas. 24/cs	114.44	82.67	89.90	85.40	74.40	108.32	107.60	64.80-174.00	97.76	5.43	96.23	89.98
5# 6/case	132.66	103.75	130.90	109.50	102.30	112.50	130.00	84.00-176.70	121.16	4.04	118.60	114.76
Quarts 12/case	180.07	122.73	133.64	121.50	145.82	138.36	138.50	105.00-280.00	141.24	3.92	140.00	136.53
Pints 12/case	107.74	84.67	75.89	82.00	111.00	75.80	102.67	54.00-144.00	87.87	4.88	90.37	90.29
RETAIL SHELF PRICES												
1/2#	4.83	4.12	4.06	3.51	3.80	3.99	6.00	2.00-7.75	4.36	8.71	4.42	4.13
12 oz. Plastic	6.07	4.99	5.00	4.54	4.67	5.62	7.04	3.00-8.99	5.38	7.17	5.48	5.26
1# Glass/Plastic	7.24	6.80	6.92	5.99	5.89	6.21	10.75	3.00-15.00	6.93	6.93	6.94	6.52
2# Glass/Plastic	12.73	10.95	11.88	10.79	10.37	9.75	16.00	5.99-18.25	11.75	5.87	11.73	11.33
Pint	11.33	8.55	8.20	11.39	8.33	10.73	12.95	4.00-20.00	9.73	6.49	10.73	9.52
Quart	17.69	14.92	14.40	15.68	15.24	17.76	20.07	8.00-35.00	16.10	5.37	16.00	15.24
5# Glass/Plastic	27.90	23.96	30.60	23.86	21.95	25.42	30.00	13.99-41.00	26.16	5.23	25.07	24.76
1# Cream	9.01	8.40	7.00	6.47	10.24	8.14	9.50	4.79-16.00	8.41	8.41	8.28	8.09
1# Cut Comb	12.31	9.44	9.40	9.64	12.00	4.50	13.67	4.50-22.00	10.88	10.88	10.70	9.90
Ross Round	9.43	6.33	8.00	10.25	8.62	9.25	8.40	5.00-12.00	8.73	11.64	7.77	8.45
Wholesale Wax (Lt)	7.64	4.78	4.58	5.71	6.00	4.54	5.00	3.00-12.00	5.82	-	5.84	5.33
Wholesale Wax (Dk)	6.70	4.49	3.73	5.87	5.90	3.88	5.00	2.80-10.00	5.39	-	5.47	5.07
Pollination Fee/Col.	88.67	68.33	60.00	68.33	80.00	133.50	136.67	30.00-200.00	84.39	-	86.43	83.00

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INNER COVER

Pretty much, and unfortunately, unless I know the beekeeper who hands me a jar of honey, I don't trust what's in a jar of honey. Well, it's not quite that bad, but almost. But I am suspect of any bottle of honey that can't prove it's from a US beekeeper. Think about this.

A (most likely) honest beekeeper almost anywhere in the world produces a crop of honey, as usual. If they aren't selling directly, he, or she, puts that honey in pails or barrels and sends it off to – a local retail packer, who, because they are local are usually pretty straight shooters, but otherwise, a wholesaler, broker, exporter – take your pick. It's at this point the chances of that honey being blended with other honeys to cover bad flavor, wrong color, high moisture, or to dilute pesticide or antibiotic contamination, or to fluff it up a bit with a non-honey sweetener, or to bulk it up a bit with just a smidge of water seem to be pretty good. Then, if that honey gets exported, another – importer, broker, packer, wholesaler, retail packer, food service supplier - take your pick – takes that honey, now in barrels or tankers and blends it with other honeys to change flavor, change color, reduce or increase moisture, add just a touch of sweetener to fluff it up a bit, or water to bulk it up a bit. Then it might go in a jar for a whole chain of grocery stores, pails or barrels for another packer, or tankers for food service.

Of course where that honey came from in the first place – from that (most likely) honest beekeeper is always a question. The number of countries exporting honey to the US each year that couldn't in a decade produce the amount of honey they export can be counted on two hands of several people. So that bottle of honey has already told me more lies before it even gets opened than 20 kids at a time caught with their hands in the proverbial cookie jar. Wrong place, wrong color, wrong moisture content, adulterated with sweeteners and diluted to make it more. And they keep getting caught. Again and again a tiny, tiny percent of what comes in gets opened and tested and found wanting. Somebody somewhere gets their hands slapped and the criminal honey goes…well, where does the honey go? And the vast majority of all of these folks know it's a tiny cost of doing business and it has essentially no effect on the flow. And, that the definition of honey is as loose as the morals of many of these folks anyway makes it pretty easy to get slippery when actually testing what's in that barrel.

There's no doubt the quality of some of the imported honey is inedible, the honesty of some exporters, importers, brokers and packers is questionable, and the ethics of many are challenged. We don't even have to investigate. They keep screwing it up and getting caught, but nobody does much about it when they do.

But honey is only one of the foods that people cheat with.

We don't consume, on a per capita basis, much olive oil in this country. Less than a liter per person per year. Italians consume about 12 liters per person per year. And it's expensive compared to, say, vegetable oil or most seed oils when used for cooking or dressings. And like honey, there are opportunities to challenge the quality of the product and the honesty and ethics of the people who handle it, from the olive grower to the processors to the exporters to the importers to the retailers.

First off, if you take a look at the olive oils on your grocery store shelf, almost all of them say they are from Italy, the home of olives and olive oil. Well, kind of. It turns out most of the olives are grown in Spain. Morocco and Tunisia grow a lot too. They get processed where they are grown and the oil is shipped to Italy. The opportunity to tweak the quality where they are grown is obvious, with inferior olives, improper processing and dilution with unolive type oils sometimes suspected. Once in Italy both the quality of the original oils and honesty of some of the handlers is brought into question. On occasion, cheaper vegetable oils are added, other olive oils are added to cover off flavors and to standardize the colors. There are even some that start with vegetable oils, add colors and ingredients to make it look, and kind of taste like olive oil, but there's nothing olive about it.

Then the grading comes in. How do you grade olive oil you ask? By tasting and smelling it, people who are well trained in tasting…like wine and even honey…to detect off flavors, adulterants, evil aromas and just plain fraud. They use colored goblets so they can't see the color and just sample the flavor. They look for up to 16 or so identifiable off flavors, and those oils that have very few, or no off flavors are labeled Extra Virgin Olive Oil. Those with some are Virgin, and those with more are simply olive oil. Price goes with the name of course. The bottles are labeled as Packed in, or Imported from Italy, which is actually legal – nothing like the government making it easy to cheat.

Those who practice these frauds are prosecuted when caught but they are rarely if ever caught, and consider it a cost of doing business when they are. A study reported in the New York Times recently indicated that 69% of the olive oil sitting on grocery store shelves in the US labeled Extra Virgin (the top quality product), was, in fact, not. Quality, honesty and

Quality.
Honesty.
Ethics.

ethics in olive oil. Seems to be pretty much the same as the imported honey market, don't you think?

But wait, there's more ways to cheat the system.

Are you familiar with saffron? It's the most expensive spice there is, made from the bright red, three filament stigma of the flower from a crocus bulb, *Crocus sativus*. Iran produces more than 80% of the 250 tons produced worldwide according to a very recent New York Times article. For scale, it takes 150,000 flowers to produce a kilo, or 2.2 pounds. A single bulb will produce 1 – 3 flowers. Outside Iran the price can rise to $10,000 a pound. Inside Iran it runs about $11 for a 4 gram package, trimmed in gold. Retail in Europe is $15 for a gram. To produce, the stigmas are harvested, dried and crushed into a powder. And it's all in the making – when in the bloom cycle and at what time of day they are harvested, how they are dried, where they are dried, how they are crushed, how they are stored – lots of ways to decrease the quality it seems. But of course there's more.

Spain is the world's major exporter of saffron spice, but it imports from Iran most of what they sell, then exports it as Spanish. Sound familiar? This is because the world's best saffron actually grows in Spain (unless you ask someone from Iran). The flowers are a bit different, the stigmas larger and of course the terroir, the soil and climate, topography and water are exactly perfect for saffron bulbs. And of course because of the price other countries grow and sell the product. But saffron grown in Afghanistan, or Italy, or Greece isn't the same as the good stuff that comes from Spain. Unless, that is, someone says it is. So country of origin gets fuzzy it seems.

Then, of course, there's good old adulteration. Dried corn silks are sometimes added, as are extra parts of the saffron flower and a host of other ingredients, neatly ground to dust and passed on as pure saffron, at hundreds of dollars an ounce.

But of late, at least the European market is beginning to tire of this fraud and has begun real science tests to determine purity. They are testing DNA samples to see where the spice actually originated, and if all of the dust in the bag you just bought is actually saffron to begin with. And, with the world market changing because of the status of Iran, exporting and importing and the actual value of money is changing, so an organization, called Saffronomics was formed. In addition to improving production and marketing they want to improve testing the material with chromatography and DNA analysis and statistics. They are concerned that in a recent test of hundreds of saffron samples, when examined, over 50% were fraudulently labelled. Most by origin (Spain), but many by adulteration. By analyzing the lipids and other biometrics they can tell Spanish saffron from all others. And, since Spain only produces 2800 kilos of saffron a year, but exports almost 36,000 kilos – the possibility of fraud is pretty near absolute. Plus now they can find the trace amounts of the junk people add and are beginning to force people to be honest.

So, if something has value, somebody, somewhere is going to cheat the system, and you, and make money with buying cheap and selling high, adulteration with low quality product or artificial additives, or water it down or reduce the concentration – if it can be stolen, someone will. Honey, Saffron or Olive oil. Bon Appitite.

•

The Hat. By coincidence, I ran into Bo Sterk at just about the time Larry Connor's article about him came out in the magazine. I was at the Florida Bee College and he had a table there promoting his Bees Beyond Borders program, helping beekeepers in the Carribbean. That's what the logo on the hat says. Though an artist by trade, he's an educator at heart, and has a program going that is doing wonders. You can find out a lot more about his worthy project at **www.beesbeyondborders.net**. Take a look, lend a hand. And thanks for the hat Bo.

•

For the past several years I've been fortunate to be able to attend, for a while as a vendor and lately just as a speaker, many of the Mother Earth News Fairs. They are held in NC, TX, OR, WI, PA and KS so they reach a good chunk of people over the course of a season. I'll generalize just a bit, but on average between 15 - 20,000 people attend over the two days they are held, and about 150 – 200 vendors come to share their wares, which range from organic seeds to garden hand tools, lotions and potions of all types, biotic elixirs that will let you live for almost ever, books and more books, compost toilets, meads, knives, survival ware, almost everything you'll ever need in a garden, how to make cheese info, wicker caskets sometimes, cookware and so much more.

Of course there are bee supplies for sale from national suppliers, Dadant, Mann Lake, Bee Thinking, and Brushy Mountain. Wicwas Press has tested the waters and is uncertain if they have a place there yet. *Bee Culture* was the first of all these to bite and ran a table for a bit selling books and giving away magazines, but, like Wicwas, was sort of overwhelmed by the massive book presence of both Mother's book store and the many publishers who are also there. Brushy is a program sponsor, which is a significant financial investment, but with it comes some special treatment. The others are a presence now, though relatively small in scale since theytook a wait and see approach to see how it went. It went pretty well.

Mother seems pleased with the beekeeping aspect of the show. Matt Reed, from Bee Thinking, Shane Gabeur and myself are on the program usually as speakers, and occasionally someone local is invited. With the attendance as it is, and the number of beginning beekeepers who show up at the talks, I'm always surprised that a local, or even a state beekeeping organization doesn't have a booth there…looking for members, answering questions, and just being visible. It's an opportunity maybe you shouldn't miss.

Now I spend most of my time with my other publisher, Quartous, who sell lots of how-to books, including those I've done over the years. We give away magazines, talk about bees and I enjoy the company of the people who work there. So if you get a chance, come on down to a Mother Earth News Fair. You will be amazed. And it's the most inexpensive way to spend a day you can imagine.

Bee Culture
The Magazine Of American Beekeeping

Get Ready For Bee Culture's Next Event

A CASE FOR HONEY

Our case of honey is filling nicely this winter. Speakers committed so far include Dan Conlon, Warm Colors Apiaries, Massachusetts; Bob Binnie, Blue Ridge Honey Company, Georgia; Dave Shenefield, Clover Blossom Honey, Indiana; Steve Conlon, ThistleDew Honey, West Virginia; Roger Stark, Howalt-McDowell Insurance, South Dakota, Joann Dunlevey RS, Food Safety Specialist, Ohio Dept. of Ag; and a Representative of The FDA. Other speakers are firming up travel plans and will be announced as they become known.

This well rounded group has all aspects of this topic well covered. U.S. Producers, Packers, Producer/Packers, Insurance and Risk Brokers, Marketing, and all the new Food Safety rules and regulations from both Federal and State level perspectives

Unfortunately, missing from this discussion will be the National Honey Board, the marketing arm of the honey industry, and those large packers and importers who have chosen to have their annual meeting on the same weekend. The coincidence has not gone unnoticed. The focus of this event will remain on promoting and informing ambitious US Honey Producers and Packers of U.S. Honey.

New this year will be a Friday Night Social held in Bee Culture's Conference Center, the location of the Two day Conference on Saturday and Sunday. It's a low-key, meet and greet with the speakers and attendees from 5pm to 7pm on Friday where you can pick up your folders with speaker profiles, conference agenda, and lots of information on Medina's dining and shopping opportunities. Supper afterwards is on your own but you'll have plenty of places to choose from, and lots of people to join with.

Tuition is $150.00 per person which includes the Friday night social and classes and an exceptional lunch on Saturday and Sunday. On line Registration opens April 1, 2016.

Friday Night Social, October 21, and classes and lunch Saturday and Sunday October 22 & 23, *Bee Culture's* Conference Center, 640 W. Liberty St., Medina, Ohio. Register early.

Mark Your Calendars Now!

October 22 and 23, 2016 at
Bee Culture's Conference Center
640 West Liberty Street
Medina, Ohio

Watch BeeCulture.com and these pages for program and registration information

It's Summers Time –

Meetings, Travel, Spring

Spring is finally in the air, at least here in Northeast Ohio, at least for this week. Things change quickly around here though.

Spring is a busy time for Kim and I. We've been doing a lot of travelling already this year. And of course, we have all of our meetings and classes that we run right here in Medina. Oh yeah, and don't forget the deadline every month. It's all good, but it keeps us hopping.

I want to talk a bit about meetings and most especially how to treat our speakers. We have been many times on both sides – planning the meetings and being speakers at meetings. Treat your speakers well, it's the good and kind thing to do.

There have been several times over the years that Kim has been basically abandoned once the meeting was over. He has sometimes had to find his way back to a hotel, find his own supper and find his own way to the airport the next morning. And remember, he's in a place that is far away from home and not familiar. If we're together it's not so bad.

What this has taught us over the years, and especially me, is to be considerate of the speakers that we bring to our meetings. In the almost 30 years that I've worked for *Bee Culture*, I've planned a lot of meetings – from 50 people to over 700 people. I make sure our speakers are as comfortable as they can be. That way they can concentrate on their talk and visiting with the beekeepers. I find someone to deliver them from the airport to the hotel. I make sure all their meals are taken care of while they are with us, and then make sure they are delivered safely back to the hotel and the airport at the appropriate time. I usually make all of their travel arrangements – flights and hotels.

The Bee Culture *team getting set up at the Tri-County Meeting in Wooster, OH.*

Speakers appreciate this. I know we do when we travel to other places to give talks. Kim gives a lot more talks than I do, so he is exposed to a lot of different groups.

Try and make all the details clear to your speakers. What are you providing for them – are you paying them? Or just covering their costs? Let them know up front so there are no surprises.

Also let them know what your expectations are of their talk – do they need to bring their own computer? Do you want handouts? If they have written a book, can they bring some to sell?

As much helpful information as you can give them just makes for a better meeting and less stress on both sides.

It's the beginning of March and we're already been to Florida for the ABF meeting in January, Cleveland Botanical Gardens in January, Mother Earth News Fair in Texas in February and Indiana in February. And Kim back to Florida in March for the Bee College down there.

There were over a thousand people at the Indiana meeting and just this past weekend – while Kim was in Florida – the *Bee Culture* team went to the big Tri-County meeting in Wooster, Ohio just down the road from us. There were over a thousand people there too. So beekeeping is popular! We sold a bunch of books and talked to a lot of new people just getting started. It's an exciting time!

If you're anywhere near Northeast Ohio the first Saturday in March next year try and make it. Just about every vendor you're heard of will be there. And there are lots of Ohio vendors that you don't know about that all have some really cool things. There is a whole track for beginners and a kid's program also. And probably the best donuts and cinnamon rolls you've ever tasted – made by the Amish. There were a lot of people there from out of state. It's a meeting worth driving too if you can get away for a couple of days. Hope to see you there in 2017.

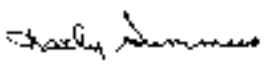
We started our beginners' class last week and have over 75 people coming out for three hours on a Monday night. Kim talks as fast and long as they will let him. When we're done they line up to ask questions. I'm not sure how long they would stay if I didn't start flicking the lights. And for goodness sake, always make sure you have enough coffee!

As usual, I'm really looking forward to Spring. We have plans for expanding the deck, expanding the chicken coop – so we can try and do better with having chickens and ducks next Spring – plans for getting a compost bin built and of course we'll start out like gangbusters with the garden. And then we'll see what happens with that. Our enthusiasm is never lacking, it's just being able to be home for extended periods of time to make it work.

All of our bees are alive. Kim discovered one hive tipped over this past weekend. Not at all sure what happened, but it was an opportunity to find out that the hive is full of bees. They were not happy.

Good luck to all of you! I hope the year goes well with your bees, your gardens and whatever else is on your agenda.

We'll keep doing what we're doing and giving you good information to help you along.



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There is nothing sweet about fraud. When it comes to economically motivated adulteration (EMA) of high-priced natural products such as honey, there is nothing new about it either. Unscrupulous sellers have adulterated high-priced honey since the beginning of recorded history. In the U.S., Dr. Harvey W. Wiley, the first chief chemist of the U.S. Department of Agriculture, wrote in 1889 "there is no other article of food which has been so generally adulterated as honey." In testimony before the U.S. Congress on behalf of the Pure Food and Drug Act of 1906, Wiley brought along a bottle of adulterated honey, complete with a dead bee a top the syrupy concoction. The bee, he explained, was meant to dupe buyers into thinking the honey was 100% pure. Instead, Wiley testified, the sugary liquid masked a number of ingredients harmful to consumers.[1]

Not much has changed over the past century, it seems. Pulitzer Prize-winning journalist Andrew Schneider made headline news in 2011 when he reported in *Food Safety News* that "more than three-fourths of the honey sold in U.S. grocery stores isn't exactly what the bees produce."[2]

As proof, Schneider's article cited numerous samples of commercial honey tested at Texas A&M's Palynology Laboratory that had no discernable pollen content. By the U.S. Food and Drug Administration's (FDA) own definition, honey that has gone through ultrafiltration is no longer honey. If Schneider's claims proved true, the commercial product sold as honey would not only not measure up to the U.S. FDA definition, but also fail quality standards set by the European Union and the World Health Organization (WHO). The latter group, in fact, argued that ultrafiltration removes all traces of honey's origin. The only reason to do that, WHO said, was to mask adulteration with an inferior honey or hide potentially dangerous additives to increase profits.[3] By how much? That depends on the amount of additives, but with pure honey now selling at wholesale prices above $5.00 a pound, adulterators can see their profits soar.[4]

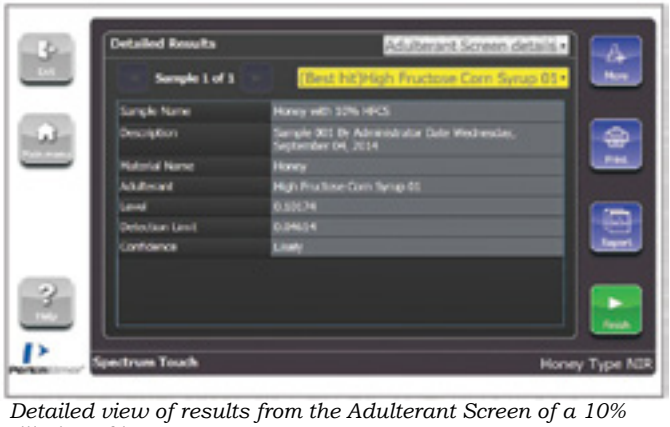
Close on the heels of Schneider's exposé came another report, this time sponsored by National Public Radio (NPR). It charged that Schneider's article was inaccurate, especially in misleading Americans into believing that all U.S. honey was ultra-purified and not honey at all. NPR learned that while most of America's commercial honey is filtered to remove impurities ranging from bee's wings to dirt, it is not "ultrafilered," and thus technically remains honey. "Bottom line: Supermarket honey doesn't have pollen," NPR reported, "but you can still call it honey."[5]

Weighing Into Murky Waters

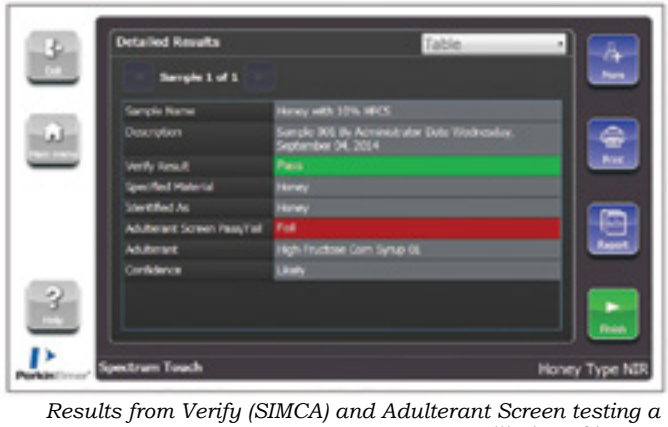
No less of an authority than the FDA finally weighed in on the honey issue in 2014. The American Beekeeping Federation and others petitioned the FDA for an official definition of the sweet, yellowish-brown liquid in the name of international fair trade and the fight against adulteration. In its response, the FDA sidestepped the issue of providing a definitive definition of its own. Instead, it agreed with the prevailing industry definition of honey as "a thick, sweet, syrupy substance that bees make as food from the nectar of flowers and store in honeycombs."[6] More importantly, the FDA decided to address the labeling of honey as its main concern using existing U.S. laws and regulations.[7]

But, here is the rub: how can you properly label what is inside the jar unless you test it? While it is relatively easy to adulterate and/or mislabel honey, detecting it has traditionally proven to be difficult, time consuming, and

[1]Harvey W. Wiley, Foods and Food Adulterants, Washington, D.C., GPO, 1889, p. 744.
[2]Andrew Schneider," Tests Show Most Store Honey Isn't Honey," Food Safety News, November 7, 2011, **http://www.foodsafetynews.com/2011/11/tests-show-most-store-honey-isnt-honey/#.VnreaBUrJhE.**
[3]Ibid.
[4]U.S. Department of Commerce, USDA National Honey Report
[5]Dan Charles, "Relax, Folks. It Really Is Honey After All," the salt, National Public Radio Blog, November 25, 2011, **http://www.npr.org/sections/thesalt/2011/11/25/142659547/relax-folks-it-really-is-honey-after-all.**
[6]Ibid
[7]U.S. Food and Drug Administration, Draft Guidance for Industry: Proper Labeling of Honey and Honey Products, April 2014, **http://www.fda.gov/food/guidanceregulation/guidancedocumentsregulatoryinformation/labelingnutrition/ucm389501.htm**



Detailed view of results from the Adulterant Screen of a 10% dilution of honey.



Results from Verify (SIMCA) and Adulterant Screen testing a 10% dilution of honey.

expensive.[8] In addition, 75% of the estimated 450 tons of honey Americans consume each year is imported – and a good portion of that is in food products that often contain more sugars than actual honey. Only a fraction is ever tested by U.S. health officials.[9]

Because it is not practical to test every ounce of honey entering the U.S, current procedures focus on suspect countries and the testing capabilities of companies importing the honey. As already noted, those tests are expensive and oftentimes not all that accurate. That, however, may be changing.

Comparing Analytical Approaches

Scientists at PerkinElmer, a global leader in human and environmental health, recently piloted three different analytical methods for adulterant detection in honey using its Frontier™ Near-Infrared (NIR) Spectrometer. In the targeted example, PerkinElmer researchers first created suitable calibration standards for Clover honey, Wildflower honey, Orange blossom honey, Organic honey, and two adulterants – high fructose corn syrup and rice syrup. They then followed a Partial Least Squares (PLS) method to successfully measure each additive in characterized honey with "known" adulterants. [SHOW CHART]

The scientists then applied a non-targeted methodology known as Soft Independent Modeling of Class Analogies (SIMCA). The SIMCA method is used to inform researchers when a product does not conform to its expected material profile. While the SIMCA test points to possible adulteration, it cannot determine either the specific adulterant or how much is present. Moreover, the SIMCA method fails to identify spiked samples of honey without developing a more refined Pass/Fail threshold.[10]

Groundbreaking Results With Adulterant Screen

The final approach tested by PerkinElmer researchers employed the SIMCA method now augmented by the company's Spectrum 10 software and innovative Adulterant Screen™ technology on the Frontier NIR. In this instance, all of the pure honey spectra were inputted into the Frontier as "material spectra", and the corn and rice syrups were entered as "adulterant spectra." The sequential analysis of SIMCA followed by Adulterant Screen provided groundbreaking results. The system not only alerted the analyst when a product did not conform, it also identified the adulterant and provided an estimate of its concentration in the honey…in this case, 4%. Any adulterant with significantly different spectra than honey would have been detected even at much lower levels, PerkinElmer scientists say. Better yet, this all happened within 30 seconds using a simple interface without the need to run multiple concentration standards required by the PLS method or the follow-up tests needed by the SIMCA method.

Finally, PerkinElmer's Spectrum 10 software and innovative Adulterant Screen™ technology offers a simple, fast, and cost-effective solution to an age-old question: "Is my honey pure?" Dr. Wiley would be proud. BC

[8]Justin Lang, Lauren McNitt, "Detection of Honey Adulteration Using FT-NIR Spectroscopy," Application Note, PerkinElmer , 2014, http://www.perkinelmer.com/CMSResources/Images/44-170813APP_HoneyAdulteration_NIR_011959A_01.pdf

[9]Ettinger, "No More Sweetwashing: FDA to Finally Regulate 'Real Honey' Definitions," OrganicAuthority.com, April 25, 2014, http://www.organicauthority.com/no-more-sweetwashing-fda-to-finally-regulate-real-honey-definitions/. See also, Rick Wills, "Foreign Producers Import Adulterated Homey," TribLive, Pittsburgh Tribune, March 7, 2015, http://triblive.com/news/editorspicks/7579824-74/honey-standard-million#axzz3vjBKaISQ

[10]Lang, *et. al., op. cit.*

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Professional Grade Infrared Cameras - ~$700 (C2), ~$1,000 - $4,400, Mid-Level, Ex Series (E4-E8)

You may ask, why rent or buy a professional quality infrared camera? Can't I see everything I need to know with an inexpensive entry level camera? Isn't that good enough?

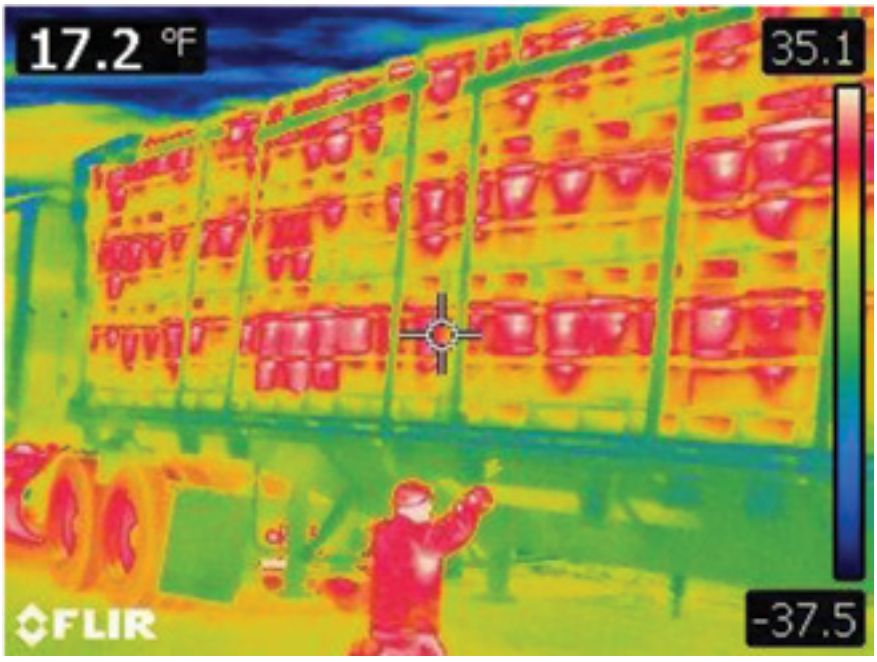
It all depends on your application. In your kitchen or at a Farmer's Market, you've probably used a mechanical spring scale, accurate to ± 0.25 oz. (28.3 gm). A digital grocery store scale is more likely to be accurate to 1/100th oz. or better, and it should also have an up-to-date calibration certificate. If you are buying cut oats at 89¢ per pound (454 gm), spring scale error may insignificant – less than a penny a pound. You might be a bit more particular about an eight to 12 oz. ribeye steak selling at $24.99 per pound. You'd be more concerned about scale accuracy if paying for caviar at $200 or more per oz. – or, how about saffron spice, which in my local store is $15.69 for 1 gm or 0.036 oz. jar?

If your primary purpose is to view a few hives in the backyard, the economic value of even an inexpensive IR camera is debatable, although curiosity, enjoyment, and ability to monitor colony status may more than justify the purchase. If you've dozens or more hives, an entry or mid-level IR camera for rapidly identifying suspect, weak and dead colonies can soon pay for itself in salary savings. If you are loading trucks to haul bees from Florida to California, I highly recommend using a higher grade, professional camera. The potential costs of making erroneous choices due to a marginal quality camera are far greater.

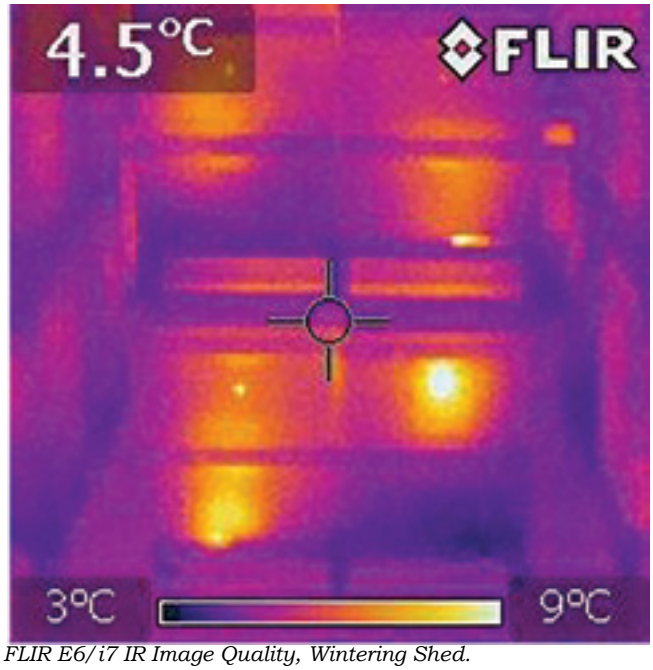
What's the difference between an entry level and professional camera? I'll use FLIR's camera line to illustrate my points, and I'll cover other brands in future articles. As mentioned in my previous articles, the ~$700 C2 is FLIR's lowest price camera designed for daily use by trained building inspectors and contractors. Pros for the C2 include good value, light weight, pocket-size, and convenient touch screen controls. It is reasonably rugged, has four color palettes, and saves thermal pictures in true radiometric jpg format – with MSX detail enhancement. Images can be exported to FLIR Tools for analysis and editing and to generate written reports – a feature not supported by less expensive FLIR ONE cameras. Cons include low thermal resolution of only 4800 radiometric pixels (i.e., temperature data points), no video recording, no keyboard for entering data or written notes, and no voice recorder for note taking.

The mid-level FLIR Ex (E4-E8) and top-level Exx (E40-E60) cameras step up to more fully featured, factory calibrated, instruments. Commercial beekeepers, building inspectors, and contractors select these cameras for ruggedness, convenient pistol grip format, higher resolution, and factory-calibrated thermal imaging.

The E4 is the least expensive of the Ex series and in many ways, its features and capabilities overlap those of the C. The C2 is less expensive, lighter, and smaller than the E4. It has a handy, built-in LED flashlight, lacking in the E4, and it has video output, but only via micro USB cable, a cumbersome approach to saving video. The thermal resolution of both the E4 and C2 is limited to 4800 radiometric pixels. Both cameras produce and



FLIR E60, Strapping hives, truck headed for California, 17.2° Air Temperature, 7:22 p.m.



FLIR E6/i7 IR Image Quality, Wintering Shed.

save thermal image files as true radiometric jpgs. Neither camera has movable temperature spot readings. The E4's spot can be repositioned in the radiometric image by using FLIR Tools software. The spot can't be moved on the camera itself.

For a beekeeper, choosing between the C2 and E4 is more or less a tossup; the C2 is smaller, very easy to use, and ~$300 less. The E4 is factory calibrated for accuracy. The deciding issue may be how much and for long the camera is likely to be used. The C2's battery is charged by plugging in the camera itself, and the battery is not designed for ease of replacement. The battery for the E4 and all of the other E series cameras is in the handle of the camera. The battery can be charged by plugging in the camera, or the battery can readily be exchanged for a fresh one. The E4-E6 cameras use a battery similar to those found in the handles of rechargeable drills. The E40-60 uses a somewhat different style battery. For all E series cameras, the battery is swappable. I strongly recommend buying spare batteries and a charging system for any E series camera. FLIR lists four hours battery duration for the Ex and Exx series; five for the C2. I usually get no more than three to four hours per charge on any of these cameras.

The FLIR Ex Series of professional cameras includes the E4 (4800 radiometric pixels), E5 (10,800 pixels), E6 (19,200 pixels), (there's no E7) and E8 (76,800 pixels) model cameras. All of these have a digital and an IR camera with MSX technology. The Ex series replaces the older i3, i5, and i7, which were thermal-only cameras. Similar in overall appearance to the higher end Exx cameras, the Ex cameras are more compact. All of the Ex series are fixed focus, point and shoot cameras, with a built-in, shutter-style, lens cap. The shutter protects the lens from dirt and scratches and can't get lost – a very nice feature. The E6 and E8 offer discernible higher thermal IR resolution, picture in picture, and more importantly adjustable temperature levels and span ranges.

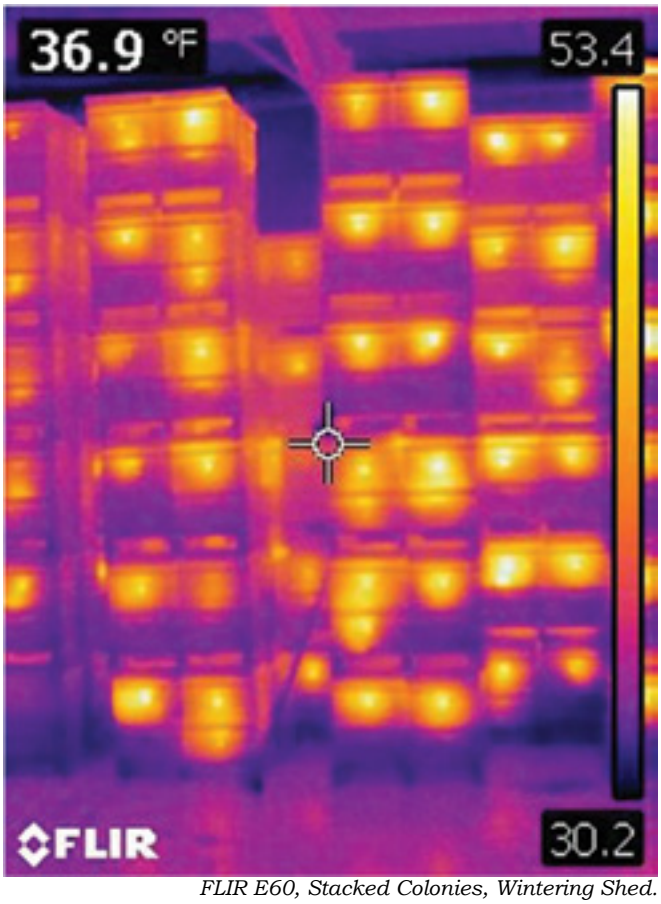
Ex cameras offer simplicity of use. They are somewhat bare-bones in terms of other camera features – there's no touch screen, adjustable focus, Wi-Fi, Bluetooth, LED light, Laser Pointer, or voice/text annotation of pictures. Only the E6 has video output, yet lacks video recording capability. Both visible and IR images can be saved to an SD card. Data transfer is via a USB cable or can be read directly from the SD card.

If you need a simple, rugged, *calibrated*, professional level camera, the Ex series is the most affordable choice. Your main deciding factor, besides cost, should be the number of pixels in the detector, since it affects overall picture quality – both with respect of legibility and number of data points available for image viewing and analysis. The E4's 4800 pixels produces noticeably blurry thermal images, as does the C2. Thermal definition and sensitivity is lowest in the E4, better in the E5, and best in the E6 and E8. Based on my trials, thermal image quality for Ex versus Exx camera models with matching numbers of pixels (e.g., the E6 and E40 have 19,200 radiometric pixels, the E8 and E60 have 76,800 pixels) are very visibly very similar, if not identical.

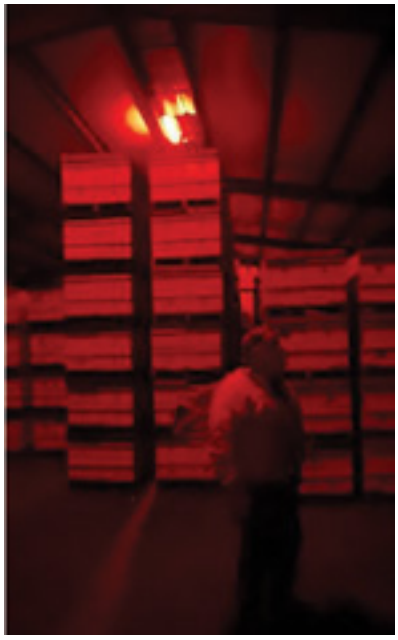
Professional Grade Infrared Cameras - ~$3,500 to $7,000; Top-Level, Exx Series (E40-E60)

The FLIR E40 (19,200 radiometric pixels, E50 (43,200 pixels) and E60 (76,800 pixels) are my go-to cameras for research and commerce. Not only is the native thermal resolution and sensitivity sufficient for clearer imaging of hives, but there are many more functions and capabilities built into the cameras and available via the Mobile Apps and FLIR Tools that are bundled with the cameras. Also, FLIR has an optional, albeit pricey, research software package for advanced thermographic analysis.

Compared to the E6-E8 cameras, the E40-E60 cameras cover comparable ranges of thermal resolution



FLIR E60, Stacked Colonies, Wintering Shed.



and add:

- WiFi and Bluetooth with FLIR Tools Mobile App to connect the camera to a smart phone or tablet for streaming and managing digital pictures and video, transferring radiometric JPEGs, adjusting levels, and emailing reports,
- Extended temperature range from -4˚F/-20˚C to 1202˚F/650˚C,
- Temperature sensitivity of < 0.07˚C at 30˚C (E40), < 0.05˚C (E50/E60).
- Video recording for producing entertaining, informative and educational thermal imaging videos,
- Touch screen controls for improved ease of use with many more measurement setting options.
- Optional changeable lenses, including wide-angle lenses to get more of a scene into one shot (e.g., bee yard or truckload) or telephoto to get closer for smaller or more distant objects.
- Digital Zoom; 2 x continuous for E40, 4x continuous for E50, E60.
- Full manual and/or digital focus control for greater accuracy and definition.

Are any of these advanced features of use to a beekeeper? Probably not, if the intent is primarily to screen for colonies in poor condition. I'd keep it simple with a point and shoot C2 or E4-E8 series camera – although before buying, I'd wait to see if the thermal resolution of the C2 will be improved in 2016. For accuracy and for visual decipherability, I prefer a resolution of 19,200 radiometric pixels or better. I also find manual temperature range and scaling to be an especially useful feature for discriminating thermal outlines such as cluster shape and size.

For any of these cameras, thermal resolution, cost, and sensitivity are important decision elements. Buying several lower cost cameras to distribute to amongst crew members and training them to use the cameras should provide a better return to a bee business in terms of improving efficiencies of labor and colony management than having only one high end camera. And if one gets lost, stolen, or broken, you've got spares.

If I made my living from bees, I'd want to have at least one top level E40, preferably an E60 camera to use for business promotion, and for specialty management options such as screening queen cells for viable queens.

For purposes other than simple colony size screening, the features of an E40-E60 camera greatly reduce likelihood of quickly outgrowing it or regretting having invested in the entry-level model. If I wanted to demonstrate delivery of a truck load of strong colonies to a grower, I'd want a professional, calibrated camera for quality control. But I wouldn't give one of these cameras to just anyone, I'd keep it on a short leash.

Which brings me to actually using thermal IR cameras in a wintering shed and for loading trucks. I was surprised at how easily each pallet could be checked by a four member crew. One by one, the driver of a fork lift temporarily set each pallet on the floor. A trained crew member with an E40 camera walked around each pallet, looking at the tops and fronts of the hives, marking with chalk any dead, weak, or suspect colonies. Two crew members followed behind, checking marked boxes. The cover was lifted, and the top box tipped back to inspect the bottom box. Under the red lights at 38-45°F, this was quick and easy. Even when pulling frames to look for brood or a queen – only an occasional bee flew off. Weak colonies could be combined together, any dead ones removed, ensuring that every pallet had four viable colonies, sufficiently strong to make grade. These were then re-stacked, ready for loading.

Trucks arrived just before or after dark. The overhead door was rolled back, the truck backed up to the door, and two fork lift operators loaded pallets, one on each side of the truck. After each truck was loaded, the load could be re-checked with the camera before being covered with netting.

Lessons Learned

Overall, under IR, strong colonies were obvious. Only a small proportion of colonies needed to be visually inspected. Occasional bee populations appeared to be smaller than they actually were, especially if the bees clustered against the back wall of a box, or on top of frames. The hives used by Arlee Apiaries have a spacer rim under the cover to make room for pollen patties. Bees sometimes piled on top of themselves in this space. Even more surprising were a few strong, queen-right colonies without brood, that weren't producing much heat. In hind-sight, I should have thought to take samples of the bees from these colonies to check for evidence of issues such as *Nosema ceranae*. I know from my own prior research that healthy broodless colonies don't always thermoregulate – apparently no brood, why worry? Very weak or dead colonies were obvious with IR. Remember, a thermal camera reads heat at the surface of the hive, it's not truly through the wall imaging. Some ambiguity is to be expected, but it's far better to get false negatives (looks weak, but is stronger) that can be checked than false positives (looks strong but isn't).

In my next article, I'll address the FLIR Tools software that accompanies these FLIR professional grade cameras. The software can only be used with true radiometric jpg images, so it can't be to analyze or adjust images saved from entry level cameras. FLIR Tools provide image management, as well as data analysis and measurement tools, E- and T-Series camera updates, video streaming, and report creation, publication, and distribution. BC

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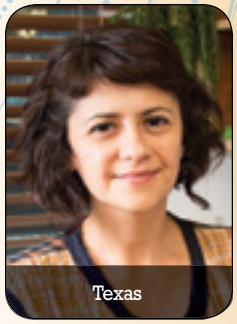

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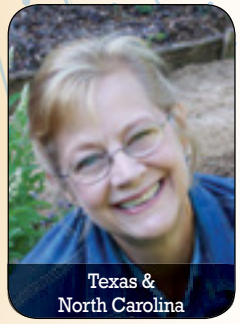

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*Yves Le Conte, Director of the French National Bee Lab (l'Institut National de la Recherche Agronomique, INRA) at Avignon, is studying an apiary of Varroa-resistant honey bees. (*photo by Jérôme Rey)

A boy drew close to a pollen-flecked bee on a flower, watching intently. He is still watching bees, decades later as head of the national bee lab in France. "I was quite alone at the beginning," said entomologist Yves Le Conte of his childhood fascination. Now he shares that passion with hundreds of collaborators.

His childhood memory is of a profusion of bees on his family farm near Le Mans – the hum, the smell; a multitude of stings did not quell his unrequited determination to train the bees like pets. At age 12, he was far more engrossed with that project than he was with school, so his mother promised him his own swarm as a reward for turning his attention to his books.

Our Bees in Peril *is the title of this book by Yves Le Conte and Vincent Albouy. Le Conte and international researchers collaborate on answers to their challenges.*

When the bees went silent in the 1980s, it was heartbreaking. *Varroa* had swept through France "like a deadly wave," he said. "All the feral colonies were dead." At that time, he was beginning his PhD work at the University of Paris, and he made a prescient choice to focus his inquiry on the mites.

On a visit to the farm in 1993, he was surprised to notice some honey bees in the chestnut trees and chimneys where they once proliferated. Curious about how they were surviving when most bees were not, he created an apiary to better understand them. He added to it by seeking out bees that had withstood the mites from beekeepers that had never treated. "I thought, 'Maybe there is something there'." But he didn't know what.

By 1990, Le Conte had begun work as a researcher at the French national bee lab in Avignon (INRA: Institut National de la Rocherche Agronomique/Abeilles et Environnement). Because the apiary at the farm near Le Mans was a full day's drive away, the bees there were untended. Yet they continued to survive for years while losses from mites continued to plague French apiaries. When he mentioned this phenomenon to a commercial bee group, they offered funding for him to study the bees, which he supplemented with government grants.

He made a decision early on to work collaboratively. He'd spent years during his doctoral studies cringing from a competitive atmosphere; he found himself more suited to open cooperation with his peers. "I should not be naïve because science is competitive," he said. "But I didn't want to make my life competitive, and I wanted to work with the best scientists. I discovered that collaboration was much more enthusiastic and efficient." So he drew other researchers into his work, and he joined theirs – several hundred by now. And together they have been able to enhance the understanding of bee metabolism, behavior, chemical communication, and reproduction. Le Conte made pheromones his area of specialty. That was another prescient choice, since interactions between the mite and its bee host is influenced by many signals, but chemical communication appears to be the most important (Nazzi & Le Conte 2015).

He and his colleagues are searching on the edge of what is known. Now, as head of the lab, he is in charge of a broad array of programs dealing with behavior, physiology, genetics and pathology of the honey bee. Some discoveries fit into the puzzle of the survivor bees, and others are simply reeled in over that edge to add to broader understanding of bee biology.

"I worked with some 70 colonies that were not treated," he said, "Some of which survived for seven or eight years. The question was: Why? We still don't have all the answers, but we have uncovered many of the characteristics that help these bees survive *Varroa*." They knew that *Apis mellifera*, *Varroa destructor* and mite-vectored viruses form a complex system of interactions.

When he started, Le Conte was aware that the idea that bees could have resistant traits to pathogens was not new, but it was not always known that the behaviors could relate to pests; a history of inquiries gave him some clues. In the 1930s, American researchers Park and Pendell observed protective traits against disease. In 1942, Woodrow and Holst reported observing bees uncapping and ridding the hive of

larvae with American foulbrood in the latent, noninfectious state – with the spore-carrying adult bees not infected. Rothenbuhler at Ohio State picked up the research in the 1950s, coining the term "hygienic behavior". He knew that it did not sort out cleanly as a Mendelian trait, but he did not have the technology to show its complex control by a suite of genes. At that time, the research was abandoned, as chemical solutions became favored over the complexity of breeding.

It was not until the 1980s that Steve Taber re-examined the behavior, and he and Martha Gilliam at the USDA in Tucson found that it produced resistance to chalkbrood as well as foulbrood. How that might apply to the devastating mites was only speculation. They encouraged Marla Spivak to take the quest from that lab to her new post at the University of Minnesota in 1993, and there she eventually developed the resistant Minnesota Hygienic line of bees.

Meanwhile, to go back to the Continent, American entomologist John Kefuss had started a commercial apiary near Toulouse, France. He was supplying bees 1983-91 to labs testing chemical treatments for mites such as amitraz and Apistan. Kefuss was at an impasse: He'd concluded that the chemicals were harmful to bees, but his doctoral mentor Friedrich Ruttner maintained that bees could not be bred against mites "any more than sheep could be bred against wolves". It was in Tunisia, on a project with entomologist Wolfgang Ritter, that Kefuss observed resistant bees in apiaries of farmers too poor to treat their hives. Both he and Ritter tested the Tunisian bees, and it appeared that the characteristic was genetic. About the same time, 1993, Danny Weaver in the U.S. was also experimenting with resistant breeding. "By 1996, we knew we could select for *Varroa* resistance," said Kefuss. Ruttner graciously conceded.

Kefuss, a bee breeder, said, "It's not important to know just why a particular strain is surviving." He explained that getting to a destination in a plane does not require an understanding of the mechanisms. To that end, he has distributed resistant queens to his neighbors to keep up open mated stock. He invites all comers to find mites in his apiary, for which he pays one Euro cent per mite – with few payoffs.

Follow that swarm! Marion Ellis of the University of Nebraska did research during his sabbatical at Le Conte's lab in Avignon, France. He said, "I've never worked in a lab with such a great esprit de corps." (photo courtesy Yves Le Conte)

Le Conte and his colleagues are on a different mission: For them, it is very important to know why a strain of bees is surviving; they want to understand the mechanisms. That is the point. To do that, they are willing to examine the biology to a molecular level.

Working collaboratively with other researchers "is a very positive experience for me. We grow together, we publish together". He has teamed up with the same two technicians at his lab for 20 years, and he has ongoing relationships with many of his international collaborators. "They send me students, PhDs, postdocs and everyone has added a stone to the building."

He has had a special connection to American researchers, as his wife's father was an American Army engineer: Among them are Gene Robinson of the University of Illinois, Marion Ellis of the University of Nebraska, Mark Winston and Keith Slessor of Simon Frazier University, Danielle Downy now of Project Apis m – and many others, including Greg Hunt, Gloria Degrandi-Hoffman, Robert Page, Amy Toth, Kristin Traynor, Marsha Wheeler, Ernesto Guzman-Novoa and Gard Otis.

It was speculation on the relationship between bees and the mites that led Le Conte to investigate pheromones – the olfactory messaging system in a colony. He worked on the discovery that he calls his "lucky" find: a brood pheromone, a complex blend of fatty acid esters exuded by the larval salivary glands, which are the source of both primer (long term effecting) and releaser (short term effecting) pheromones (Le Conte 2006). With Gene Robinson at the University of Illinois and others, he spent more than eight years toward a discovery of a forager pheromone that inhibits nurse bees' behavioral development. It insures the equilibrium between nurses and foragers in the colony. Then the team found a highly volatile brood pheromone involved in social regulation, E-β-ocimene. With it, young larvae express their nutritional needs to workers with a signal to optimize food collection. Le Conte established that it is a primer pheromone. (Note: bees are the only social insect for which any primer pheromones have been identified.) He and his colleagues found that E-β-ocimene has two effects on worker physiology: inhibition of worker ovaries and acceleration of the age of the onset of foraging for workers (Maisonnasse 2010).

E-β-ocimene is produced by newly hatched to three-day old

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larvae, whereas the previously identified brood ester pheromone, a contact pheromone effecting nurses, is produced primarily by old larvae – four and five days old. "So one compound gives an opposite message to the other," said Le Conte. "Interesting, very interesting. The signal from the very young larvae is for bees to forage because they are in need of food. When they are older, they have their food, they're good to go and they can release the foragers."

The significance of these pheromones to *Varroa* is that they act as kairomones (substances produced by one species used to the benefit of another). In sum, the mites tune in to the bees' communication system to guide their parasitism. Handy for *Varroa*, brood pheromone increases up to 20 times during capping, when mites need to sense that it is time to enter the cell.

"That was my first work," said Le Conte, "And I have worked on it ever since."

Le Conte spent his sabbatical year in the U.S. at Gene Robinson's lab at the University of Illinois. He said, "Gene was the first to use more sophisticated analytical tools," which allowed their team to make an important discovery.

Robinson writes, "We became close colleagues and friends for over 25 years and counting. One of the high points of my career was my laboratory's collaboration with Yves and members of his laboratory to find the worker inhibitory pheromone, a pheromone that is produced by older adult worker bees and inhibits the behavioral maturation of younger workers . . . Finding it proved to be elusive. Teaming up with Yves' lab we did indeed find it – and it has been a lynchpin in our understanding of how division of labor is regulated in the honey bee society."

That substance, ethyl oleate (EO), is so far the only primer pheromone identified in workers that is involved in foraging behavior. It is synthesized de novo by adult forager honey bees (Leoncini et al 2004). It is nearly absent in young bees, although it is perceived by them through olfaction, and acts to delay the onset of foraging. It is most abundant on the worker cuticle and transmitted at close range – picked up by olfactory receptors on antennae, processed in the antennal lobe, and learned in olfactory centers of the brain (Muenz et al 2012).

What is the function of this inhibitory pheromonal message, opposite to the brood pheromone E-β-ocimene that signals the onset of foraging? One known fact is that EO is produced by foragers when exposed to ethanol from fermented nectar. Experiments with live bees fed ethanol demonstrated that EO is produced, accumulating in the honey crop and exuding to the exoskeleton. It exerts a primer effect on young bees to delay foraging and stay home (Castillo et al, 2012). Honey would ferment without enough in-house processors.

An interesting twist is the relationship of EO to bees infected with *Nosema ceranae* (microsporidian parasites). It has been found that Nosema infection reduces homing and orientation skills and alters metabolism of foragers. *N. ceranae*-infected bees also show increased EO levels, which delay the maturation of same-age healthy bees. It has been suggested that it is a protective response, extending the lifetimes of healthy bees inside the hive (Dussaubat et al 2013).

The role of identified pheromones was explored by Le Conte with Mark Winston and Keith Slessor of Simon Frazier University – their complexity, synergy, context, and dosage over space and time. Their work demonstrated that these specialized chemical signals provide a syntax that is deeper in complexity and richer in nuance than previously thought. (Slessor et al 2005). Le Conte pointed up over his desk to a fishing photo of Slessor, who died in 2012, he said, "Here he is. We were good friends."

He keeps a friendship with Winston, who wrote that "We worked together on a number of projects involving honey bee pheromones – Yves is a delight to work with. It was quite a thrill!"

Work with Danish stock at the INRA lab revealed that Nosema-resistant bees tolerate a higher *N. ceranae* spore load, an up-regulated immune response, and lower mortality (Huang et al 2012). A recently discovered trait of *N. ceranae* is an ability to manipulate apoptosis (healthy, programmed cell death) in hosts to improve their invasion. However, the Nosema-tolerant stock has been found to escape that mechanism (Kurze et al 2015).

But the Nosema-tolerant bees are not the same as the *Varroa*-tolerant bees. The stock resistant to Nosema came from Denmark, where beekeepers had selected against Nosema for a long time. The 2011-12 onslaught of *Nosema ceranae* in the *Varroa*-resistant Avignon apiary brought heavy losses, "But 20% of the

Lavender fields surrounding the National Bee Lab at Avignon, France. (Photo by Marion Ellis)

remaining bees were very, very good, and we grafted from them, and they have done well." The Avignon apiary is open-mated in an area of other apiaries and the Le Mans apiary, which continued to thrive, is more isolated.

Le Conte has also collaborated with John Harbo at the USDA Baton Rouge lab on an analysis of the brains of VSH (*Varroa* Sensitive Hygiene) bees to identify genes involved with that expression. VSH is a trait discovered and developed by a team at that lab. Bees with the trait have ability to sense and rid the colony of pests and pathogens. Selection for VSH has resulted in not only resistance to Varroa mites, but also to American foulbrood and chalkbrood, as well as, reportedly, defense against wax moths and small hive beetles. The trait involves a small group of genes, VSH alleles (alternate forms of genes).

However, *Varroa* tolerance is a complex phenomenon involving many genes associated with metabolism, behavior, chemical communication, reproduction. Using gene expression as a tool, the French lab studies the molecular basis of host-parasite interactions.

In investigating the mechanisms of VSH behavior, Le Conte's young colleague Fanny Mondet concluded that antennae play a key role. Enhanced detection of some odorants as well as higher metabolism and antennal motor activity were found in bees with VSH behavior (Mondet 2015). This work brings attention to the role played by the bees' peripheral nervous system, adding criteria for promoting genetic-marker-assisted selection for *Varroa*-resistant bees.

The lab studied two "natural" survivor honey bee populations in cooperation with the I. Free lab in Sweden. Colonies in Avignon and Gotland, Sweden were compared with *Varroa*-sensitive colonies. They found more reproduction of mites in sensitive colonies. The survivor stock had coevolved resistant traits that reduce the reproductive success of the mite by about 30% in both places. But, interestingly, under similar selection pressures of mite infestation, the two geographically and genetically distinct populations have evolved different mechanisms of resistance: The Avignon population had high levels of mite infertility, while in Gotland there was a higher proportion of mites that delayed initiation of egg-laying (Locke et al 2012). "We saw that gene expression favors *Varroa* multiplication, said Le Conte. "Genes are expressed up and down in the pupae, and expressed differently in parasitized pupae,".

Adaptation appears to be a local occurrence. Even with accumulated understanding of resistant traits, it appears that the bee showing excellent performance and superior pest and pathogen tolerance across all environments does not exist. An 11-nation project, "The Pan-European Genotype-Environment Interactions Experiment", was conducted by the Research Network for Sustainable Bee Breeding, a working group within the international research consortium COLOSS (prevention of COlony LOSSes). Local bees and non-local bees were compared within the five sub species of *Apis mellifera (A.m. mellifera, carnica, ligustica, macedonica, siciliana)*. The local strains consisted of breeding lines maintained at the institutes involved and other regional stock. The local strains were compared to at least two non-local strains over 2½ years. Survival time differed noticeably, with the local strains surviving longer – the French lab's longest. "It seems logical to me," said Le Conte, "Because if you put one ecotype of a bee that is well adapted to a biotope and you take it to a different biotope, the bees may not be able to adjust to both the environment and the mites."

In addition, that project demonstrated that viruses exhibit substantial genetic variation across regions. It was suggested that local bees may be better adapted to "their" strains of viruses.

In the COLOSS study, the local bees were more gentle and better honey producers. The Avignon resistant bees build up naturally too late to pollinate orchard crops, however. Beyond their significant role in research, Le Conte said, "We need feral colonies to pollinate in nature, so they can perform an important function there" – since the honey bee is native to Europe.

Among other observations on the French resistant, naturally selected bees is that their propolis contains more caffeate. Le Conte said, "We have not understood whether it is environmental (the resin is simply available) or behavioral (that the bees shop selectively for the most advantageous medication)."

Le Conte said, "When we look at gene expression of the resistant bees compared to sensitive bees parasitized by the mites, the gene expression is in the pupae. There is up and down regulation of genes as a result of the parasitism. We found 99 genes activated or deactivated – differently expressed. It is not a question of resistant or not resistant, but a question of what the mite is doing on the pupae."

Other genetic effects of *Varroa* infestation have been found in the gene expressions of the nutritive effects of pollen (a field called nutrigenomics). Pollen activates nutrient-sensing and metabolic pathways as well as genes affecting longevity and the production of some antimicrobial peptides. But *Varroa* infestation and the concurring viral infections inhibit protein metabolism, and the effect was not reversed by pollen uptake (Alaux et al 2011).

As the French lab explored the characteristics of their survivor stock, some conclusions were reached: The *Varroa* population the bees are exposed to is genetically not reduced in virulence. Significant differences in viral loads were found between surviving and control colonies: Controls had more APV (Acute Paralysis Virus) and CPV (Chronic Paralysis Virus), (but when injected with virus there was no significant difference for APV or CPV, so it appears that resistance occurs before invasion). Behavioral responses demonstrate the better capacity of the surviving bees to recognize the mite. Hygienic behavior was not greater in resistant bees than sensitive ones; the resistant stock shows VHS behavior.

What now? Le Conte and his colleagues posit that coevolution by natural selection has been hindered by apicultural practices that remove the mite, and consequently remove selective pressures. Marla Spivak of the University of Minnesota calls it a co-evolutionary arms race with pathogens serving as selective pressures, allowing for survival traits to emerge. But Spivak, like Le Conte, asks people to take the pattern, not the product. They offer insight, not beehives.

"I think that the scientific

community is now convinced that selecting for resistance is possible – which is very exciting to me," said Le Conte. "The idea is to find tools. They can be genetic markers, they can be physiological markers, pheromones or kairomones. And these tools could tell you whether to select a colony as a breeder."

There is a lot to be said for this international band of collaborators as contributors to this quest. Robinson said that Le Conte has "significantly advanced the field of bee biology." Winston said that the INRA lab is "certainly one of the top honey bee research groups in the world, perhaps the best in Europe in combining basic and applied research. Yves has a wonderful sensibility recognizing the importance of bees for the environment, and seamlessly crosses the boundary between research and the beekeeping community."

Ellis, who spent a sabbatical at the lab, said of Le Conte, "I've never worked in a lab with such a great esprit de corps. Every day when we went to work, he greeted each person personally and would reply to inquiries as to how he was doing: 'Impeccable'. Nobody I've ever met can create that environment like Yves – supportive and holding to a very high standard. His strong suit is that he is wonderful at collaborating and giving others credit. He's gotten to the top of this field not by stepping on others but by bringing as many people with him as possible. He is the master of collaborative work; it is the only way to handle a lot of complex problems"

Traynor also celebrated working with the "close-knit team." Downy recalls the camaraderie of a daily stroll with the lab group through the orchard to lunch: "It sounds simple, but the differences that stick most in my mind are the lifestyle and cultural ones. Yves is generous and cheerful – an ambassador of bees, of joie de vivre, of family life and of course science!"

Le Conte is not ready to announce the coup de grâce to *Varroa*, or to Nosema either. "The bees themselves found the solutions. To me it was natural selection. We have some explanations, but we don't have all of them. We are really interested to see more of what happens."

His hope is that *Varroa* will go the way of tracheal mite as just a beekeeping nightmare from the past. "I am not the only lab working on this," he said. "There are many. All together we can do this." BC

Yves Le Conte will speak at The Marin Beekeepers on Thursday, May 5, 2016 (**http://marinbeekeepers.org/**) and at The Bee Health Symposium at UC Davis, Mondavi Honey and Pollination Center, on Saturday, May 7 (**http://honey.ucdavis.edu/**).

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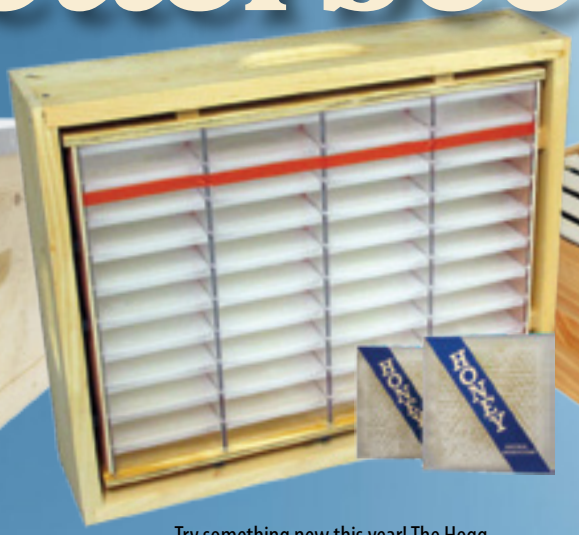

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A Closer LOOK

FEEDING SUGAR SYRUP/HMF

Clarence **Collison**

Honey bees naturally obtain carbohydrates by collecting honeydew or nectar.

Honey bee nutrition plays a vital part in developing and maintaining healthy and strong colonies. Carbohydrates are essential as they provide energy for all activities within the hive and during foraging. Honey bees naturally obtain carbohydrates by collecting honeydew or nectar. When natural sources are limited or harvesting honey by humans has removed a colony's supply of carbohydrates, supplemental feeding by beekeepers is necessary and commonly done (Haydak 1970; Brodschneider and Crailsheim 2010). Usually sucrose solution, inverted sugar syrup, or other syrups such as starch syrup or high fructose corn syrup (HFCS) are used for that purpose (Jachimowicz and El Sherbiny 1975; LeBlanc et al. 2009; Brodschneider et al. 2010; Brodschneider and Crailsheim 2010). Since it was found that some sugars, such as galactose, mannose and lactose are toxic to honey bees in certain concentrations (Barker and Lehner 1976; Barker 1977), these sugars have not yet found their way into supplemental feeding.

In addition to toxic sugars, another toxic substance that can be found in syrups that are fed for colony nutrition and survival is 5-hydroxymethyl-2-furaldehyde or, as it is more commonly referred to as, 5-hydroxymethylfurfural (HMF). Hydroxymethylfurfural is a chemical compound that is formed from carbohydrates, especially fructose, under thermal and/or acid-catalyzed degradation conditions. HMF is widely recognized as a marker of quality deterioration, resulting from excessive heating or inappropriate storage conditions in a wide range of foods including juices, jams, syrups and honey (Jachimowicz and El Sherbiny 1975; Alabdeen Makawi et al. 2009; LeBlanc et al. 2009; Zirbes et al. 2013). In fact, the Codex Alimentarius of the World Health Organization and the European Union (EU Directive 110/2001) have defined a maximum HMF quality level in honey as 40 mg/kg as a deterioration and heat treatment indicator for temperate regions and 80 mg/kg for tropical climates.

In the United States, high-fructose corn syrup (HFCS) has become a sucrose replacement for honey bees and has widespread use as a sweetener in many processed foods and beverages for human consumption. It is utilized by many commercial beekeepers as a food for honey bees for several reasons: to promote brood production after bees have been moved for commercial pollination, when field-gathered nectar sources are scarce and to boost food reserves for overwintering colonies.

High-fructose corn syrups (HFCS) are obtained by enzymatic isomerization of corn syrups, which can be produced by both acid and enzymatic hydrolysis of cornstarch; the enzymatic procedure is the most utilized in the manufacturing process. Originally, acids were used to convert the corn starch into a glucose/fructose mixture; sodium hydroxide (NaOH) and hydrochloric acid (HCL). Newer processes include using chemicals and genetically modified bacteria. Three different enzymes (α-amylase, glucoamylase, and glucose-isomerase) are needed to transform cornstarch into the simple sugars glucose and fructose. After a complex fractionation and combination process, mixtures with various amounts of fructose can be obtained: HFCS-42 (42% of fructose), HFCS-55 (55% of fructose), or HFCS-90 (90% of fructose). The remainder of the sugar fraction is glucose and some traces of unnamed oligosaccharides. These water based formulations range from 71-77% dissolved solids (LeBlanc et al. 2009). The fructose/glucose ratio is such that crystallization is avoided, and the low pH allows the HFCS to resist fermentation and bacterial contamination (Ruiz-Matute et al. 2010).

Due to the ease of handling HFCS over mixing sucrose solutions and cheaper pricing, the use of HFCS for bee feed increased rapidly. However, questions about the safety of HFCS as a bee food were raised soon after it became available, because beekeepers reported mixed results from feeding it (Bailey 1966; Johansson and Johansson 1976, 1977; Anonymous 1996). In addition, researchers found decreased longevity in worker bees maintained in the laboratory on HFCS as compared to honey (Barker and Lehner 1978) or to sucrose syrup (Weiss 2009).

"Originally, acids were used to convert the corn starch into a glucose/fructose mixture; sodium hydroxide and hydrochloric acid."

Honey bee colony feeding trials were conducted to determine whether differential effects of carbohydrate feeding (sucrose syrup vs. high fructose corn syrup) could be measured between colonies fed exclusively on these syrups (Sammataro and Weiss 2013). In one experiment, there was a significant difference in mean wax production between the treatment groups and a significant interaction between time and treatment for the colonies confined in a flight arena. On average, the colonies supplied with sucrose syrup built 7,916.7 cm^2 honeycomb, while the colonies supplied with high fructose corn syrup built 4,571.6 cm^2. The mean mass of bees supplied with HFCS was 4.65 kg, while those supplied with sucrose had a mean of 8.27 kg.

There was no significant difference between treatment groups in terms of brood rearing. Differences in brood production were complicated due to possible nutritional deficiencies experienced by both treatment groups. In the second experiment, colonies supplemented with sucrose syrup through the winter months at a remote field site exhibited increased Spring brood production when compared to colonies fed with HFCS. The differences in adult bee populations were significant, having an overall average of 10.0 frames of bees fed the sucrose syrup compared to 7.5 frames of bees fed exclusively on HFCS.

Contamination of honey and different sugar solutions with HMF has been extensively investigated. LeBlanc et al. (2009) found HMF concentrations of commercially available HFCS of different brands ranging between 3.1 and 28.7 ppm HMF for fresh syrups. They also analyzed the formation of HMF in several samples of HFCS under different temperature conditions. Results showed that constant high temperatures can cause high levels of HMF, especially in acid-catalyzed HFCS. For example, a temperature of 49°C (120.2°F) can cause a formation of more than 200 ppm HMF over a period of 36 days. Some samples exposed to 69°C (156.2°F) for the same time amounted to HMF values higher than 30,000 ppm HMF. Ruiz-Matute et al. (2010) found HMF concentrations ranging from 26.9 to 102.3 ppm in samples of HFCS. Samples supplied by manufactures showed lower HMF levels than those supplied by beekeepers. Suggesting the former were fresh and properly stored. The syrup samples containing the highest concentrations of HMF were stored in metal tanks, standing outside unprotected from sunlight, and hence, were likely exposed to high temperatures, especially during the Summer months.

Fresh honey usually contains no or low amounts of HMF (Bogdanov et al. 1999). Due to this fact, the HMF content has become one of the most important criteria in honey quality evaluation (White 1994). On the European market, honey must contain less than 40 ppm HMF when sold (Codex Alimentarius Commission 2001; Council Directive 2002). Due to improper storage, honey, that naturally shows an average pH of 3.91 for floral and 4.45 for honeydew honey (Doner 1977), can develop a high concentration of HMF during storage, just like HFCS, which is quite similar in sugar composition and ph-value (Ruiz-Matute et al. 2010). Short-term heating of different honey samples for 60 seconds at 100°C (212°F) caused an increase of HMF concentration from 3.9 to 10.1 ppm HMF (Tosi et al. 2001). Karabournioti and Zervalaki (2001) exposed honey of several botanic origins to different temperatures for 24 hours. They found HMF concentrations ranging from 1.9-29.2, 2.2-32.6, 4.3-39 ppm HMF at temperatures of 35, 45 and 55°C (95°, 113°, 131°F), respectively. Exposure to 75°C (167°F) for 24 hours resulted in HMF concentrations from 43.4 to 226 ppm HMF. Ajlouni and Sujirapinyokul (2010) found HMF values ranging from 0.36 to 34 ppm in fresh, unprocessed, and 2.2 to 75 ppm in commercially-processed Australian honey samples. Additionally, they observed that five out of seven short term (two minute) heat-treated samples of honey showed significant increased HMF values. Alabdeen Makawi et al. (2009) found high HMF concentrations in Sudanese honey samples (up to 922 ppm), which had been stored for several years.

Numerous studies have shown that HMF can be toxic to adult honey bees. Bailey (1966) discovered that honey stored for many years and, therefore, contained high amounts of HMF caused increased mortality to bees, as compared to fresh honey. He also observed that HMF caused gut ulceration, resulting in dysentery. Jachimowicz and El Sherbiny (1975) showed that a level of 150 ppm HMF in an inverted sugar solution (produced by acid hydrolysis) containing glucose, fructose and sucrose caused significantly increased mortality within 20 days in caged bees. A concentration of 30 ppm HMF, which is below the maximum allowed in honey, did not cause a significant difference in mortality of adults. LeBlanc et al. (2009), feeding HMF contaminated HFCS, reported results very close to those of Jachimowicz and El Sherbiny (1975) and found that over a period of 26 days, 250 ppm HMF caused mortality significantly higher than found in any of the other (lower) treatment groups. Smodiš Škerl and Gregorc (2014) investigated the longevity of workers fed with purchased and homemade sugar candies containing different concentrations of HMF and found that caged bees fed with 915 and 437 ppm HMF had a shorter lifespan as compared to test groups receiving 53.3 or lower ppm HMF. The toxicity of HMF to honey bees is increased by syrup crystallization. During the crystallization process, a part of the syrup becomes solid and the HMF is concentrated in the liquid portion, being the unique phase accessible to honey bees (Wilmart et al. 2011 as cited by Zirbes et al. 2013).

Since HMF is toxic to adult honey bees, Krainer et al. (2015) investigated

the toxicity of HMF towards larvae. Artificially reared larvae were exposed to a chronic HMF intoxication over six days using six different concentrations (5, 50, 750, 5000, 7500 and 10,000 ppm) and a control. The mortality was assessed from day two to day seven and on day 22. Concentrations ranging from five to 750 ppm HMF did not show any influence on larval or pupal mortality compared to controls. Concentrations of 7500 ppm or higher caused a larval mortality of 100%. An experimental LC_{50} of 4280 ppm on day seven and 2424 ppm on day 22 was determined. The calculated LD_{50} was 778 µg HMF per larva on day seven and 441 µg HMF on day 22. They also exposed adult honey bees to high concentrations of HMF to compare the mortality to the results from larvae. On day seven larvae are much more sensitive against HMF than adult honey bees after six days of feeding. However, on day 22 after emergence adults show a lower LC_{50}, which indicates a higher sensitivity than larvae. As toxicity of HMF against honey bees is a function of time and concentration, their results indicate that HMF in supplemental food will probably not cause great brood losses. Yet sublethal effects might decrease fitness of the colony. BC

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Breeding Mite-Biting Bees To Control *Varroa*

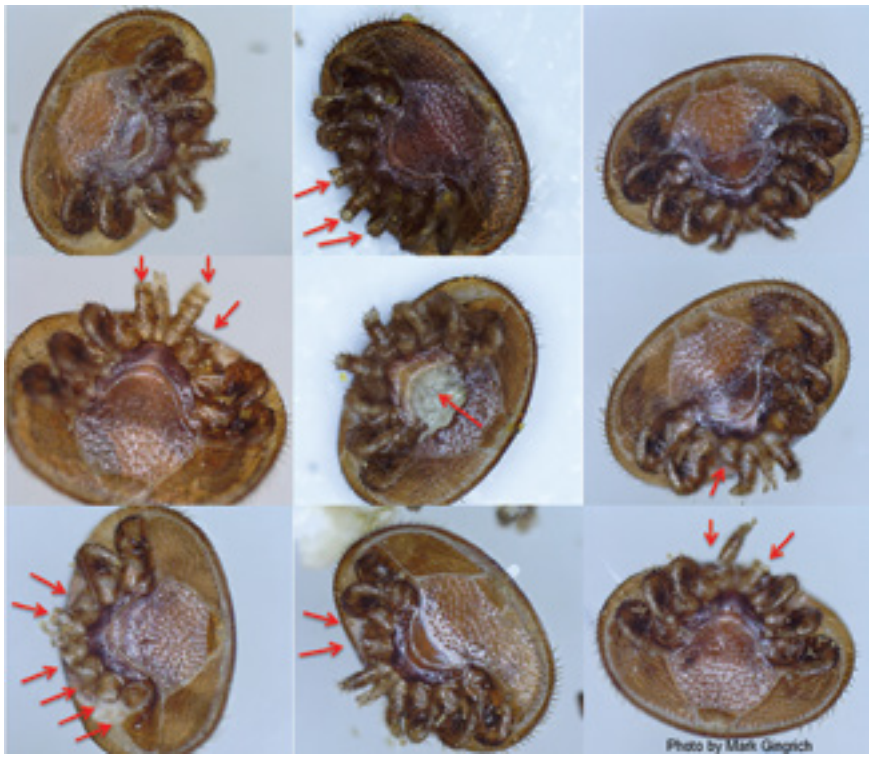
Greg **Hunt**

Introduction.

Despite the general recognition among beekeepers and bee researchers that *Varroa* mites are the number one risk factor for honey bee colony mortality, a look at the Bee Informed Partnership national surveys tells us that most beekeepers are hobbyists and most of them do nothing to control for *Varroa* mites in any given year, and those that do not control mites have much higher colony losses (2010-2014). There are some non-chemical practices that beekeepers use that help control mite levels such as introducing a break in the brood cycle by splitting colonies and re-queening, or the use of screened bottom boards. There are also some commonly used mite control practices that research has shown are ineffective, for example the use of comb with small cell sizes (Zhou et al. 2001; Taylor et, al. 2008; Ellis et al. 2009; Berry et al. 2010; Coffey et al. 2010; Seeley and Griffin 2011). One important non-chemical strategy for sustainable beekeeping is use of mite-tolerant honey bee stocks.

Progress in selecting for resistance to *Varroa* has been slow but there is evidence that the bees have begun their own fight against the mites. Some queen breeders are trying to help bees in this fight by incorporating lines of bees that have been subjected to natural selection by surviving without miticide treatment, such as Russian bees imported to North America by the USDA (Rinderer et al. 2010). Another approach is to select for specific traits that are effective at lowering mite populations. A study in Europe found that colonies with low mite populations had damaged mites falling from the bees (Moosbeckhofer 1992) and other studies have suggested that grooming behavior is important for resisting mite infestation, as it is in the mite's original host, the Asian honey bee (Peng et al. 1987; Boeking and Spivak 1999; Mondragon et al. 2005). However the benefit of using the proportions of damaged mites as selection criteria has been questioned (Rosenkranz et al. 1997).

Varroa-sensitive hygiene (VSH) was discovered as an important mite resistance mechanism by measuring the growth of *Varroa* populations in many colonies with queens that came from different sources (Harbo and Harris 1999; 2005). The VSH trait has been effectively incorporated into breeding lines and VSH queens are commercially available (Rinderer et al. 2010). A similar study with another set of queens showed that in those colonies grooming behavior was the trait that was most closely associated with reduced mite levels. Higher-grooming colonies also were more likely to bite the mites (Arechavaleta-Velasco and Guzmán-Novoa 2001). At least two other studies also showed a link between grooming behavior and the proportion of chewed mites falling from colonies. Cages of bees that removed a higher proportion of mites from themselves in a lab assay had fewer mites left on the bees, and the proportion of mites removed correlated with the proportion of damaged mites on sticky boards from the source colonies (Andino and Hunt 2011). Another study looked at four pairs of allegedly mite-tolerant and mite-susceptible lines from different populations. In each comparison, the more resistant stocks had more vigorous and effective individual grooming behavior when a mite was put on worker bees, and had higher proportions of chewed mites falling from the source colonies (Guzman-Novoa et al. 2012). This means that when bees are selected for low mite population growth they tend to be better groomers. Genetic studies identified regions of honey bee chromosomes and candidate genes that influence both of these complementary resistance traits but using DNA markers to select for good resistance genes is not very practical in our opinion (Tsuruda et al. 2012; Arechavaleta-Velasco et al. 2012). Even after confirming an individual gene's effect on a trait, the value of selecting based on DNA or protein markers would be limited because other unknown genes also influence these traits so you would only increasing the frequency of some of the "good genes." It seems that at least for now the best way forward is to select based on the trait itself.



Mites that have been chewed by the mite-biters

We conducted a breeding program to select for "mite biters." Here we describe some of the selection methods, correlations between measures of grooming behavior and mite levels, and the results of a beekeeper stock evaluation.

Methods.

Breeding population and selection. The breeding population was established in 1997 from diverse sources, including queens from commercial queen breeders: some Carniolans from California breeders and one each of VSH and Russian colonies from Glen Apiaries. But many of the colonies in the population were those that had survived for years without miticide treatments. Each year the population consisted of about 100 colonies. It was not a closed breeding population. Occasionally, queens from other Midwest queen producers or feral colonies were introduced. Queens were all marked with paint and records kept of supercedure events. Initially, breeder queens were either instrumentally inseminated or open-mated. Daughter queens were open-mated in two mating yards one mile apart and isolated from all but a few other beehives by two miles. They contained selected drone-producing colonies with one or two frames of drone comb. From 1997-2006 breeder colonies were selected based only on low mite population growth as measured by two to three counts of mite fall on sticky-board sampling sheets during the Spring and Summer.

Beginning in 2007 we began selecting for mite-grooming behavior. For the early years we treated colonies with miticide if *Varroa* levels were too high (usually >100 mites falling in a day late in the season). For the past six years no mite controls have been used and we do not split the colonies very often so there are minimal breaks in the brood cycle, which would reduce mite levels. Breeder queens were selected based on the proportion of mites that had damaged legs or an apparent bite in the body (the idiosoma) of the mite. To measure the proportion of chewed mites, plastic sampling sheets were sprayed with vegetable oil and slid underneath colonies that had screened bottom boards (Country Rubes, Grass Valley, CA) and left for two or three days. Using enough vegetable oil makes it fatal for the mites, and also for any ants that might try to feed on them. Mites were carefully removed from the sample board using a small paintbrush and placed belly up (ventral side) in rows on microscope slides. If fewer than 10 mites were present the data was recorded but not used for selection decisions. The number of mites on sticky boards was recorded, slides were examined with a microscope (15X), and the number of mites missing legs or leg parts or showing mutilation of the idiosoma was counted. Pale immature mites were not examined because these could have fallen as bees emerge from brood cells and may be more susceptible to damage unrelated to grooming behavior. Sometimes empty shells – the idiosoma with virtually no contents were observed. These were not counted because we do not know their cause. The relative severity of mutilations was also scored as low, moderate or high, meaning most mites had multiple legs chewed and bites to the idiosoma were seen. Selection was hierarchical, which means that we first selected colonies with the highest proportion of chewed mites that were highly mutilated. We secondarily selected for low mite population growth and colony strength over the season. Colonies were re-queened if they had high mites or had chalkbrood or other brood diseases. A hygienic behavior test was usually performed on potential breeder queen colonies, which were required to show at least 95% hygienic removal of freeze-killed brood within 24 h (Spivak and Downey 1998).

In 2009 selection was based on the results of laboratory grooming assays for mite removal as well as the proportion of chewed mites in a colony (Andino and Hunt 2011). Beginning in 2010, we tested all of the colonies at least two or three times per season for the proportion of chewed mites and each breeder queen was instrumentally inseminated with semen from multiple drones from one or two selected hives. During 2013 and 2014, we tested for correlations between mite drop and the proportion of chewed mites. Because of a mistake that was made in 2014, the total number of mites was not counted in colonies that had more than 70 mites falling on the sampling sheets but the proportion of chewed mites was recorded for a sample of 70 mites. There were seven of 56 and 19 of 63 colonies in this category for May and August measurements, respectively.

Beekeeper stock evaluation. In late June 2014 we initiated a beekeeper stock evaluation program by providing marked commercial-source queens and "IN mite biters" from the Purdue breeding program to beekeepers. This was a blind study; beekeepers received marked queens to identify the sources but were not told which ones were mite-biters. Beekeepers were asked not to treat to control *Varroa* mites. We purchased queens from three Western queen breeders (two Carniolan and one Italian). We chose two IN mite-biter grafting sources to test. Participants were asked to de-queen a colony and split it so that one commercial-source and one IN queen could be introduced into each half, presumably starting with equal mite loads. Beekeepers were asked not to treat colonies to

Krispn Given looking at mites.

control mites and to report whether they survived for a full year. Some beekeepers also provided data on mite levels, honey production, personal observations and preference for one queen source over another.

Results and Discussion.

The proportion of chewed mites is a heritable colony trait

It was possible to increase the proportion of chewed mites in the breeding population, even though we selected from a base population of only about 100 colonies. These results show that the trait is heritable. Starting with an average of 3% chewed mites, the proportion of chewed mites increased steadily (Figure 1). There no doubt is experimental variation because different observers scored the mite damage, but only one individual scored mites in any given year. We have also observed VSH activity in some colonies in the breeding population but haven't routinely tested for it. Because the starting average for chewed mites was low (3%), it could be that the earlier selection for low mite populations resulted in higher levels of VSH in the breeding lines.

Evidence that grooming reduces mite populations

On the two sampling dates in 2014 we observed a significant inverse relationship between the proportion of chewed mites and mite drop, suggesting that grooming behavior is effective in reducing mite levels (Table 1). We were not sure whether to include colonies that dropped fewer than 10 mites or the colonies that had 70 or more (reported as just 70), so we analyzed the data with and without these colonies. In general, colonies with fewer mites on sticky boards had higher proportions of chewed mites. Although we always saw a trend in this direction, the correlation was not statistically significant in 2013. During 2013 there was high variation in mite levels. There were 13 out of 42 colonies in June that had less than 10 mites falling on the sampling sheet but five had 122-277 mites falling during the same three days. By August the variation in mite drop among hives was even higher. It is possible that when mite populations get too high that grooming behavior is insufficient to control population growth and the proportion of chewed mites is lower as a result. One difficulty in finding a relationship between mite-biting and mite levels in our colonies may be that they are not uniform in size and in colony history. For example, mite populations decline when a colony is re-queened because there is a break in the brood cycle and mite levels are higher in colonies that have a lot of brood. We also do not know how much VSH behavior varies in the colonies. One of our grafting sources in 2014 exhibited this trait by removing mite infested brood within 48 hours (Fig 1). It maintained low mite populations and had a high proportion of chewed mites dropping on the sticky board. But in general the 2014 results suggest that grooming is effective at reducing mite levels, at least when the mite population is not too high.

	Including <10 mites dropping	Including the 70-mite values	
		YES	NO
May	**YES**	0.016	0.017
	NO	<0.01	<0.01
August	**YES**	0.001	<0.001
	NO	0.07 (N.S.)	<0.01

Table 1. Correlation between low mite drops and high proportions of chewed mites. In 2014, colonies with a higher proportion of chewed mites had fewer mites as measured with sticky boards.

There appears to be good reasons for bees to bite mites. Bites from worker bees can remove legs, which interferes with the mite's ability to move and to hold on to bees, and also opens them up to dessication. It was recently shown just that 2-heptanone from worker mandibular glands, long thought to act as an alarm pheromone, actually is an anesthetic to invertebrates. A worker bite to a small wax moth larvae or the application of only 0.061 microliters of 2-heptanone to the back of *Varroa* mites causes temporary immobilization. This may be the main function of this chemical for the bees (Papachristoforou et al. 2014).

Not enough is known about different variables that influence the trait 'proportion of chewed mites' and repeated testing of colonies shows that it varies much more than we would like, which means it is influenced environmental effects. Perhaps when a large patch of adults emerge from the brood more mites fall passively. Another difficulty is that colonies that are effective in reducing mite populations often have insufficient mites on the sampling sheet, especially in the Spring. This is a good problem to have! But it necessitates choosing the Spring grafting sources depending on data from tests done the previous year.

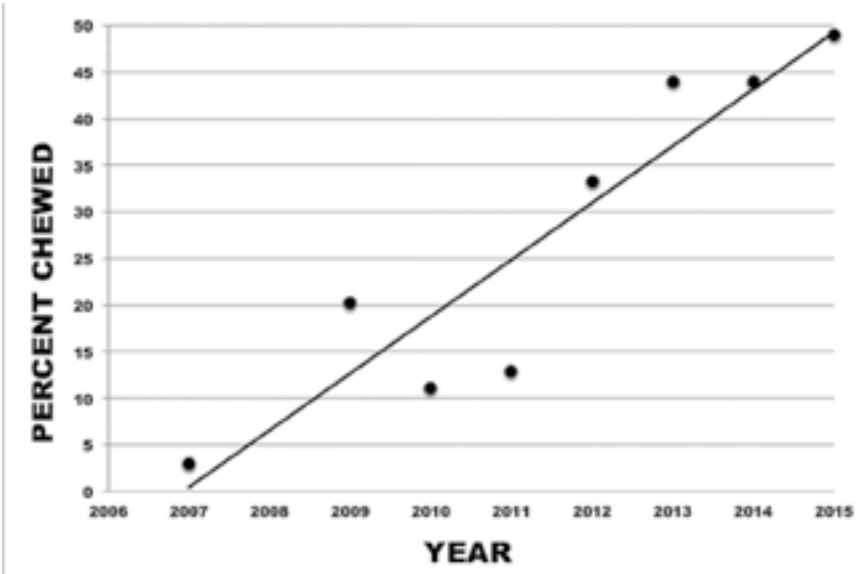


Figure 1. Response to selection for chewed mites. *The average proportion of chewed mites increased steadily in the breeding population.*

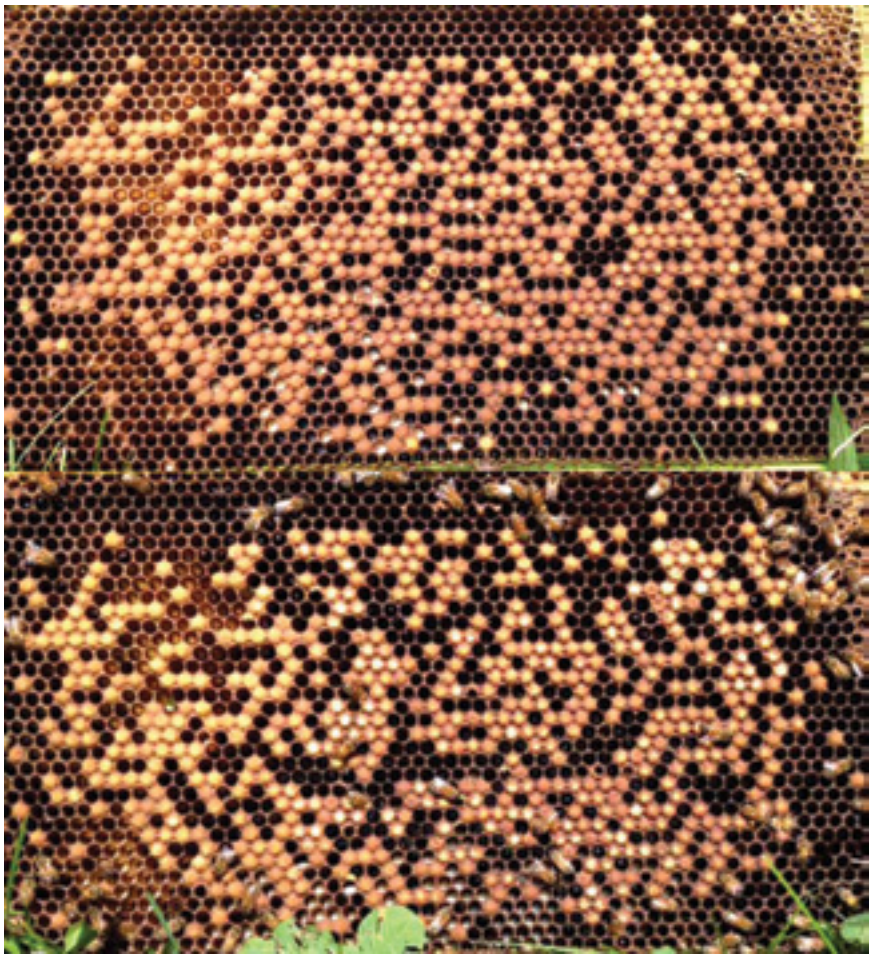


Figure 2. Evidence of* Varroa*-sensitive hygine (VSH). *A drone comb infested with* Varroa *mites was inserted into one of our recent breeder colonies for 48 hours. This figure shows the before (top) and after (bottom).*

Better screening methods are needed that can be performed on colonies even if they have few mites. We are considering making initial selections based on the proportion of chewed mites and then using a secondary lab assay to observe grooming behavior of individuals or groups of workers to choose grafting source and drone colonies. We are also considering more regular testing for VSH.

Community stock evaluation

We distributed 102 queens to 39 beekeepers in 2014. We received data from 23 beekeepers from IL, IN and OH that successfully introduced both of the queens into splits that came from one hive and evaluated them for a year, which represents 54 queens or 27 side-by-side comparisons of the two types of stock. Beekeepers were given a single pair of queens to compare, except for one beekeeper that had four pairs of queens and another that had two pairs. The three commercial queen sources from Western states did not differ from one another in survival or mite levels so they were combined into one "commercial" stock for beekeeper evaluation. Likewise, the two IN queen sources did not differ from one another and were combined into one "IN" stock for evaluation. Most colony mortality occurred during the Winter; some of this was starvation and some was probably mite-related. A few colonies died before the Winter from unknown causes, perhaps queen failure. By March of 2015, only six of 27 commercial colonies (22%) were surviving. In contrast most of the IN colonies (15 of 27 or 55%) were still alive.

Honey yields were estimated based on reports from 14 beekeepers over both years. Making the assumption that a medium depth super yields 30 lb. of honey and a shallow yields 20 lb., commercial source colonies produced an average of 11.7 lb. compared to 52.1 lb. for hives with IN queens, a 40.4 lb. difference. Most colonies did not produce surplus honey the first year, so most of the yield difference was caused by differences in survival. But there were also some differences in colony strength. Relative colony strength was reported in 12 cases; hives with IN queens were rated stronger for eight, weaker for two and equal strength for the other two.

Eight beekeepers reported on *Varroa* mite levels for both types of queens during 2014 or 2015 using either powdered sugar shakes, alcohol washes or sticky board sampling. One of these beekeepers reported a lower mite count in the commercial source hive (two thirds of the IN mite-biter level on a sticky board a month after introducing queens). Two beekeepers reported no mites in the IN colonies but found either six mites (powdered sugar shake) or 147 (sticky board) in the commercial colonies. The other seven beekeepers reported that the commercial source colonies averaged three-fold higher mite levels compared to those with mite-biter queens (2.7-fold higher for the eight comparisons).

Of the 11 beekeepers that stated a preference, 10 chose IN mite-biter queens over commercial-source queens in this blind comparison. One of those that preferred the mite-biters was comparing four pairs of queens. Two beekeepers mentioned that the colonies with IN queens were more defensive. One of these two said that the IN hive was slightly more aggressive than the other hives but that he preferred it because it was more productive. The other said that the commercial-source hive had very high mite counts (tested with alcohol wash) and was dead by Christmas. On the other hand, the IN hive had lower mite levels in the Fall, which were further reduced after Winter, but was "extremely defensive" and had 20 frames of bees by July of 2015.

Queen Source	Honey Yield n=14	Alive Aug. 2015, n=27	Relative Mite Load, n=8	Beekeeper Preference
Commercial	11.7	6	2.7	1
Indiana	40.4	15	1	10

Table 2. Results of community stock evaluation.

This experiment was limited in scope because it only compared daughter queens from five mother queens. We also did not compare the "mite-biter" queens to other Midwestern stocks, which may have similar or better survival. We have seen other stocks that have relatively high proportions of chewed mites and believe this trait can be selected for in any genetically diverse population of bees. We do not know if this trait shows genetic dominance. One test of this would be to take virgin queens of low-biting stock and let them fly in our mating yard to see how their progeny do. There may also be environmental effects that influenced survival that had nothing to do with genotype or that interacted with genotype, such as exposure of queens to Nosema or virus, or the mating conditions. So we can't make any strong conclusions but the large difference in winter survival and the beekeepers' preference suggest that breeding for mite-grooming behavior in local stocks of bees will make beekeeping more sustainable in the North Central US. Stocks from this breeding program are being made available through the Heartland Honey Bee Breeders Cooperative. We think that it is important that queen breeders select for both VSH and grooming behavior in bees that have survived Northern Winters. BC

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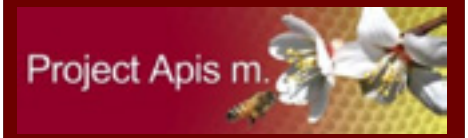

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'How a swarm of honey bees finds its home'
'How honey bees live in the wild'

PROFESSOR FRANCIS RATNIEKS
'The Sussex plan for honey bee health & well-being'

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'Skep making & history' by Bryce Reynard,
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To book online go to www.scottishbeekeepers.org.uk
(please note that a booking fee will apply)

E-mail: bookings@scottishbeekeepers.org.uk

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PRIZES FOR THE BEST DRESSED MAN AND WOMAN IN TARTAN!

10 WAYS TO FAIL, AND HOW NOT TO

Bee Clubs Are Broken By Ignoring The Value Of The By Laws.

Michele **Colopy**

Organizations can be revitalized, and re-made into better organizations when "bad things happen." Rules are developed to curb behavior(s) that led to inappropriate use of club funds, unethical influence in voting on club business, or Board members benefitting financially from club activities. By Laws are developed and amended to ensure "everyone plays well on the playground."

State Councils of Nonprofits and national nonprofits with affiliate (state and local) groups, created Standards of Excellence to guide and improve the function, organization, and controls of and within nonprofits. These Standards

of Excellence also help prospective donors determine the best place to make their contribution. Standards of Excellence for nonprofits is a tool to guide groups to "play well on the playground."

Organizations involve first and foremost people gathering together for a single purpose. However, organizations, nonprofit or not, can be quickly broken or destroyed by those same people.

In the previous *Bee Culture* issues I presented the basics of starting a nonprofit. The most difficult part of starting a nonprofit are developing the By Laws/Constitution/Articles of Incorporation. Certainly, you can get standard documents to utilize, but your group needs to seek information from other bee clubs as to what works for them, what were their problems, and how did they resolve them. The governing documents of the bee club are not written once and forgotten. They need regular attention.

Bee Clubs are broken by ignoring the value of the By Laws, by not updating them, and by not having a diverse group of the membership reviewing and revising them. Review of the By Laws should not be left to the Board of Directors. The Board has an inherent bias in changes that will constrain its authority. Certainly, some Board members need to be part of the process of By Laws review, but sometimes Board members are the reason the By Laws are being reviewed and revised. The most important aspect of a nonprofit organization, or a bee club is the bee club comes first, not personal agendas, not personal profit. The bee club is the "entity" all of the members and the Board must protect, strengthen, and help to ensure its longevity.

How can a bee club be broken?

#1-Not understanding the bee club's liabilities. While lawsuits against nonprofits are rare, and the courts have rarely found against the nonprofit, the liabilities and risks inherent in groups is still high. Board members, and the membership are at risk of legal actions against them for injuries at meetings, field days, and special events (conferences). The personal assets of Board members and the membership need to be protected. Bee clubs must understand the need to protect themselves, and the bee club, and secure insurance. Talk with a local insurance carrier and discuss the activities of your club. Insurance coverage will vary based on the club's activities and assets. Even if you hold a field day at a member's bee yard, the club insurance will protect the beekeeper and the attending membership at "club sanctioned activities." Be a responsible Board, obtain at least three quotes for insurance coverage for property and liability insurance, and Director's and Officer's Insurance (D & O Insurance) to protect the Board, the membership, and your bee club. Some State beekeeping associations may offer discounted insurance coverage to clubs which are members or affiliates of the State Beekeeping Association. Insurance is just a cost of being a responsible bee club.

#2-Personal agendas in contradiction to the mission, and the needs of the membership. For example:

Leaders promoting *only* their bee management practices, which may not necessarily be "best" management practices, violating the mission of the bee club, which typically states a broad definition of "education of beekeeping and beekeepers."

Leaders who feel their level of beekeeping is better than others either in experience, number of hives, revenue earned, natural beekeeping, in-hive treatments, or wintering success are not being good leaders representing all beekeepers. Commercial, sideliner, and backyard beekeeping is not better or worse than the other. When beekeepers divide themselves at the local level, those practices spiral out of control dividing beekeepers in communities, within their state, and across the nation. The differences in beekeeping are the demands beekeepers place upon their honey bees, which affect the management practices for our bees. All beekeepers have the same concerns affecting their bees: pesticides, pests, pathogens, and poor forage. Commercial, sideliner, and backyard beekeepers all must manage their bees relative to pesticides, pests, pathogens, and poor forage. We are all beekeepers, working to improve beekeeping, and the health of our bees.

New club leaders do not want to act like former Egyptian Pharaohs, who tried to eliminate the history of previous Pharaohs. Quality leadership takes the past

successes of leaders and builds upon them for the good of the club, and supports the mission of the club. It is the bee club and its mission that must be catered to, not individual agendas, not personal issues. All organizations, not just bee clubs have these issues, but good Board management, recruitment, and development will alleviate problems before "they are elected." Beekeeping has a history of personal agendas impacting beekeeping starting with H.A. King and Rev. Langstroth in the 1860s. Board development and recruitment is key to successful, progressive, responsible leadership of organizations.

#3-*Individuals "hogging" the same leadership positions for 10 or more consecutive years.* This limits new ideas, and growth of the club. Eventually the club becomes that tenured leaders club, instead of a club of, for, and by the members. We must continually seek and train new leaders in our bee clubs. This involves getting to know your fellow bee club members. A great conversation starter with a club member is "how are your bees?" As beekeeping grows, clubs are gaining beekeepers with diverse skills in law, bookkeeping, medicine, website development, and various other skills. Clubs need to reach out to those members, and get them involved in their club. In this way clubs begin to train new leaders for the club. Current leaders should actively seek and work with members so they can train their replacement. Those are responsible leaders. Volunteers do not always "volunteer;" they have to know they will be welcomed, and their skills are wanted. An announcement at the club meeting is an announcement, it is not "asking an individual." Talk to your fellow club members, what do they do, how can they help, and *ask* them personally to help with the club. As the Vice President of a State Bee Assn. recently stated, "People do not care how much you know, until they know how much you care."

#4-*Board members using the membership as a singular customer base to sell bees and bee equipment.* If no other companies, or beekeepers are allowed to sell to club members, this is a conflict of interest for that Board member, and it is unethical.

#5- *Stealing club funds.* You probably thought stealing from the club's bank account would be the #1 way to break a club, it is not. Funds can be recovered. Theft can be prosecuted. Stealing money from organizations does happen. When a level of trust builds up with a Treasurer of five or 10 years, members stop examining or questioning the accounting, until it is too late. A quality, responsible Treasurer will welcome annual audits, and reviews and monitoring of the budget and the financial records. The club funds belong to the members, and the Treasurer and the Board must protect that trust, and the funds.

The bank account for the bee club should be opened in its own Employer Identification Number (EIN). EINs are free, and easy to obtain (**www.irs.gov/Businesses/Small-Businesses-&-Self-Employed/Apply-for-an-Employer-Identification-Number-%28EIN%29-Online**). If a bank account is opened using a member's Social Security number (SSN) the club risks losing those funds to tax liens, garnishments, etc. associated with that member's SSN.

Bee club funds should never be kept in the private, personal bank account of a Board member. A Board member that offers to do this in order to save the club the cost of bank fees is setting themselves up for club fund issues, as are the club members who agree to such an arrangement. There are inherent costs to running an organization. Get a separate bank account for the bee club.

#6- *Immediate family members serving on a Board at the same time.* This leads to packed votes on the Board, or worse yet, it will bring a bad relationship into the middle of the Board for "everyone to enjoy." Family members serving together on a Board places the other Board members in a tenuous position of voting against someone's spouse: no one wants to be in that position.

#7- *Hiring immediate family members as an employee to work for the bee club.* Nepotism causes problems in any business, even those businesses owned by family members. Bee Clubs should not subject their fellow Board members, and the club to family issues, to voting to hire or to fire a fellow Board members' son, daughter, spouse, or brother-in-law "in need of a job." Contract work by immediate family members may be different. If a beekeeper contracts with the club to teach the beginning beekeeping class, and her husband sits on the Board, he must recuse himself from the vote, and the discussion of the contract, and the final Board vote. Additionally, the conflict of interest must be acknowledged in the Board minutes, and that Board member should not "supervise" their spouse for the bee club's beekeeping class.

This is short term, contracted work, for which the Board also received bids from other interested, qualified individuals, who proposed to perform the limited work. For transparency and fairness, and to show the club members the Board is responsible with the funds, three bids for contract work, and for large purchases should be submitted to the Board for review, and that the costs adhere to the budget.

#8- *No one new wants to be a leader.* The lack of new leaders can be the result of poor leadership. If the leadership ignores the needs of the members, discounts news ideas, disparages a different way of accomplishing a task or project, those leaders are driving away future leaders. Bee clubs will only survive through the introduction of new ideas, new members, and new leaders. It is the responsibility of the club leadership to actively seek new leaders, and train their successors. If the same leaders continue doing the same thing year in and year out, they will burnout.

#9- *The club leader is retiring, and he/she wants the club to fail or end with them as the final leader.* Leadership that has been stagnant often is the result of personal agendas driving away members, and only attracting individuals who want little from their club except cookies and coffee once a month. Some bee clubs, just like any organization, may be destined to fade and cease when the leader chooses to end their tenure with their club: and it should!

#10- *Leaders stating no one wants to volunteer.* Good leaders reach out to others, value others, and seek the support of others. A bee club is a group effort. If leaders are professional, responsible, fair, and working to support the mission of the bee club, others will see that and want to volunteer. People want to come to a club for the camaraderie, and the shared experience with others who all care for the same thing: honey bees. Members will feel better if they are asked to do something. Learn which members love to bake, those who only have time to set-up the meeting room, or haul the equipment for the field day, who loves Facebook, or creates websites. Tasks can be simple, and one-time only, but it starts the interaction, and the sense of value in the members. "Show me you care about me, and I will care about the club."

Leading any nonprofit is work. With the right leaders, the support of members, and a singular focus on the mission of the bee club, we can work together to sustain, and grow beekeeping. If you are considering becoming a nonprofit, feel free to contact the Pollinator Stewardship Council. We assist our members with nonprofit development, helping you decide if you should or should not become a nonprofit. We also will be a fiscal agent for bee club members and pollinator partner members for your projects. BC

Additional resources:

Standards for Excellence Institute **http://standardsforexcellence.org/**

National Council of Nonprofits-Principles and Practices **https://www.councilofnonprofits.org/tools-resources/principles-and-practices**

Compendium of Standards, Codes, and Principles of Nonprofit and Philanthropic Organizations **https://www.independentsector.org/compendium_of_standards**

Michele Colopy is the Program Director for the Pollinator Stewardship Council. She holds a Master's degree in Arts Administration/Nonprofit Management from The University of Akron, and has created, revitalized and held leadership roles in nonprofit organizations for twenty years.

An Easy Way To Make Comb Honey

Herman **Danenhower** and Jack **Rath**

A century ago most honey was sold in the comb as cut comb or in wooden sections. With the tremendous interest in local and unprocessed food, the Hogg Halfcomb system provides the perfect way to appeal to the public with a clean presentation which the bees prepare by building their combs directly in a clear styrene tray. This elegant product allows the consumer to see the comb in cross section and observe how the cells slope uphill, keeping the nectar from falling out until the bees are done with the ripening and sealing the cells.

The Hogg Halfcombs are a cassette system which contain 40 cassettes or sections per super. Each individual box is coated with beeswax and is ready for the bees to start building out the comb, resulting in what we call a half comb. This allows the consumer to simply serve the honey in the container and pop the lid on and off as needed.

As with any comb honey product, the Hogg system requires a strong honey flow and very strong colonies. By splitting the hive into two colonies we are trying to discourage swarming but keep the colonies strong and motivated. This article describes an easy technique suitable to novice beekeepers. It is important to note that all beekeeping is local and beekeepers need to know their area and honey flow.

The Danenhower Split

Herman Danenhower keeps bees in Kutztown, in southeast Pennsylvania. Last year he used this technique on 50 colonies, with only four hives which didn't do well. The remaining 46 colonies produced 3000 saleable halfcombs for an average of 65 sections per hive. It was an exceptional honey year as 40 sections per hive are more typical. One advantage of this method is that the queen does not need to be located or handled. Queen excluders are used to isolate the queen and restrict her laying to a single brood box. One requirement for the modified split is the availability of early season queens since you will be creating another colony.

Setup (First Step, Figure 2)

Herman prepares for comb honey production about two weeks prior to the main honey flow. In his area of PA this is mid-dandelion bloom about the 20th of April. It is essential to begin before hives prepare for swarming. Strong, overwintered colonies in two deeps are examined to see that there is brood in both the upper and lower hive bodies. These hives have not been previously reversed. If there is brood activity in the lower hive body and the colony is strong, a queen excluder is placed between the boxes. If no brood is present in the lower box, wait a week and recheck.

Another excluder is placed on top of the second hive body and a shallow or medium super with drawn comb (if possible) is placed above the second excluder. This super is added to allow room for storage of dandelion and other early honey. It also acts to discourage the bees from placing pollen in the comb honey supers. If the overwintered hive already has a super on it, that super can be left above the second excluder. In this situation it is necessary to be certain that the queen is not confined in the super. This is easily accomplished by shaking the bees off of the frames back into the hive. Note that the queen does not need to be located or handled. These preparations have accomplished two things. When the split is made it will be easy to determine where the queen is. The box with eggs and young larvae contains the queen. The other hive body only contains older brood and should be ready to accept a new queen.

The Split (Figure 3)

Examine the hive 10 days after the above preparation. You need to determine which hive body has the queen by looking for eggs and young larvae. Remove the honey super on top and the top excluder and examine the upper hive body

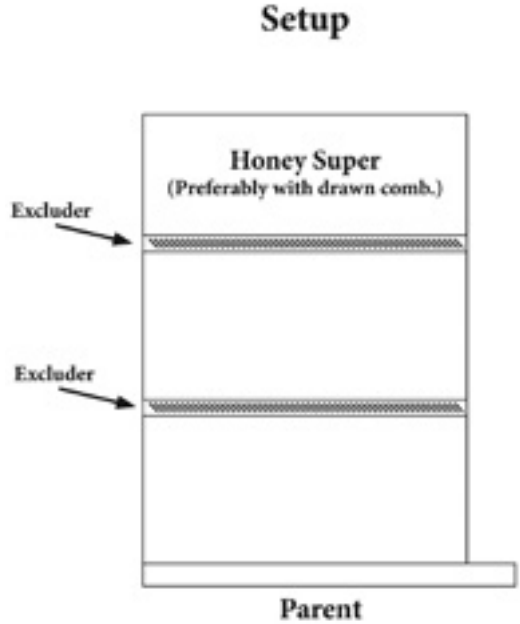


Figure 2.

for eggs and young larvae. If no eggs and larvae are found, the lower brood box is examined. The brood box with eggs and young larvae (and queen) is placed on its own bottom board and turned 180 degrees so that it faces the opposite direction. It can be adjacent to or behind the original hive. Add an inner and outer cover to this hive. We call this new hive the **set aside**. It has a queen, plenty of nurse bees and young brood. Most of the field bees will return to the original parent hive, strengthening it and setting it up to make comb honey.

The brood box without eggs is left on the original bottom board. We call this hive the **parent**. A mated queen is introduced into this box. Remove the excluder and place the honey super on top of the brood chamber. Place a Hogg Halfcomb super atop the honey super.

We have accomplished several things with these manipulations. The parent hive has no brood to care for and a strong field force. They can devote their energy to gathering honey because initially there is no brood to care for. They will move honey up into the Hogg super to make room for the new queen to lay eggs. The new queen will start to lay eggs in about five days. Since there has been a 15 day break in the brood cycle the combination of a break in the brood cycle and a new young queen will be a good deterrent to swarming.

The set aside hive should be checked in two weeks to determine if they need an additional hive body. There are many options for the set aside. It can be given a second hive body and used for extracted honey. Alternately it can be moved to a different yard during active flight hours. By doing this the field bees remain and will boost the comb honey producing colony. Alternately the hive can be reunited with the parent comb honey colony later in the season.

Hives producing comb honey should be checked weekly to see if they need a second super. A second super is given when the first super is about half full. In general completed comb honey supers should be promptly removed as the main honey flow lessens. The combs will be whiter and the product more appealing to the consumer if removed promptly. A triangle bee escape works well for comb honey removal.

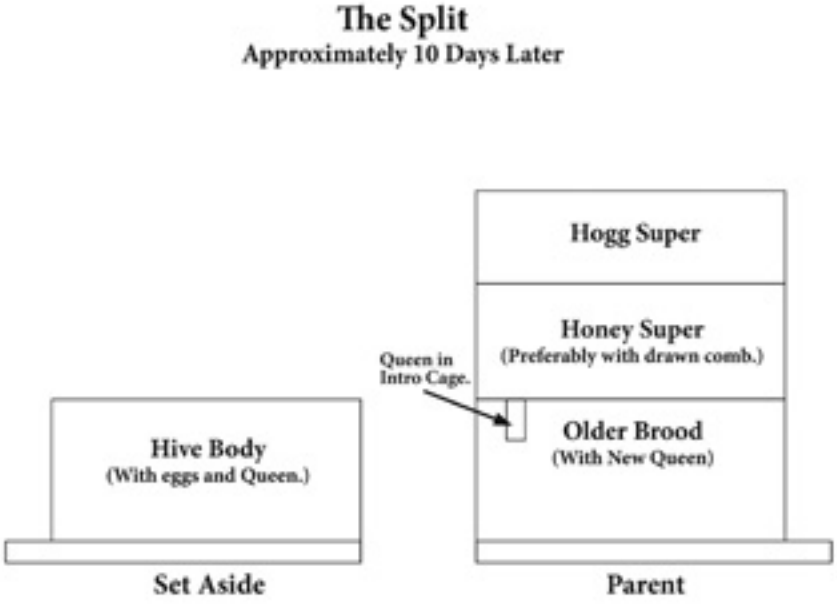


Figure 3.

Alternate Methods for using the Hogg Halfcomb

All techniques for successful comb honey require strong hives, overflowing with bees. Bees are more reluctant to work in the individual cassettes, so crowding is necessary to induce them to work the individual cassettes. One method that works fairly well is to add a queen excluder and two drawn honey supers at the start of the dandelion blossom. Once the main honey flow starts, colonies that are starting to fill supers well are selected for comb honey production. Remove a partially filled extracting super, leaving one on as a buffer. Redistribute removed supers to other colonies producing extracted honey. A single Hogg super is given to each colony. The field bees that were in the honey supers will return to their hive and these strong populous colonies will often do well filling the Hogg super. Herman feels that offsetting the buffer (sliding it forward about one quarter inch to provide an additional entrance) is beneficial and will decrease the tendency for these strong hives to swarm.

An unconventional method that sometimes works very well is to hive a swarm into a single, mostly filled with honey, medium honey super. The swarm is anxious to provide an area for the queen to lay and will move the honey up into the Hogg super, filling it nicely. Again the swarm has no brood to care for and can devote their efforts to foraging and moving honey out of the brood nest. Timing is critical here. If the flow is strong they may fill a halfcomb super in a week.

Herman runs about 100 hives for extracted honey. As the honey flow is starting to wane he will sometimes put halfcomb supers on hives that might need extra room. Sometimes these hives will fill a comb honey super nicely. These colonies should be checked in about two weeks. Colonies that are doing well are allowed to continue producing comb honey. Other colonies will do little with the comb honey supers. These should be removed before they become propolized and darkened.

Often there are partially filled Hogg cassettes, but these are not a loss. They are removed from the colonies and the bees are allowed to rob them out. These partially drawn (but empty of honey) cassettes can be used the following year when Herman selects strong colonies at mid-dandelion bloom. If the bees are starting to work in the bottom deep he will add two of the supers containing partially drawn combs. Bees will readily start to work these drawn halfcombs and these colonies will often do very well producing comb honey with no manipulations. Offsetting the buffer super by sliding it forward slightly is helpful for these colonies.

One technique that is possible in areas without intense honey flows is the use of eight frame Hogg supers on 10 frame equipment. The 8 frame super is placed on a strong 10 frame hive. A board is used to cover the gap. The thought is that a strong hive on a moderate flow will more readily fill the 32 combs in an 8 frame super rather than the 40 combs in a 10 frame box.

The finished halfcombs have real "eye appeal." Herman uses different color labels to differentiate the fuller 12 ounce sections from 10 oz sections. Today much of the public needs to be reintroduced to the joys of comb honey. It is the ultimate natural and local product. BC

Herman Danenhower keeps bees in Kutztown Pennsylvania. He has been producing Hogg halfcombs for many years. He concentrates on comb honey.

Jack Rath, a retired dairy veterinarian is an owner at Betterbee in Greenwich, NY where he manages the overwintered nuc and queen program. Herman and Jack have enjoyed collaborating as the Hogg halfcomb has been reintroduced to beekeepers and consumers.

References and Links

Here is a video of John Hogg demonstrating his method for producing halfcomb honey: John Hogg on Producing Hogg Halfcombs.

Another video of Herman Danenhower demonstrating the Juniper Hill Split is available here. **Herman Danenhower demonstrates the Juniper Hill Split** This technique works well but we have heard from several people that they would like a simpler technique more suitable for novice beekeepers.

Other references:

Miller, CC, *Fifty Years Among the Bees* A.I. Root Company, 1911

Killion, Eugene, *Honey in the Comb* Dadant Publishing, 1981

BEST HIVE TOOL?

Jim **Thompson**

I hear that question a lot and I didn't give it much thought until I started building a display of hive tools.

I remember when I was mentoring a person to become a beekeeper and he showed up wearing two pairs of trousers, two long sleeved shirts and a veil that was duck taped to the outer shirt. His smoker had more duck tape than leather on the bellows and he was ready to do battle. I asked him if he had cleaned his hive tool and he answered "What's a hive tool?" So I asked, "What do you open a hive with?" He replied, "A screwdriver." So I guess that a screwdriver could be considered as a hive tool. Going back in history, a screwdriver was actually one of the tools that the early beekeepers used.

I thus began a search to find references to old hive tools. What I found was that in 1869 there were tools that were used to scrape and pull debris out the front entrance of a hive and tweezers to catch and kill wax moths. Some of these tools look similar to the top bar hive tools of today. Then I found references to the "Ideal" hive tool in 1907 in an advertisement in *Gleanings in Bee Culture*. In that advertisement it is easy to see that the Ideal Hive Tool could be known by different names such as: the William Muench hive tool, A Dr. Miller hive tool as he recommended it, and Root, Newman and Rowe.

Also in 1907, L.F. Sawyer patented his invention of his "Bee Knife." In 1915 a bee article mentioned that beekeepers used an assortment of butcher knives, a glazer's knife, and a tool made from a ground down buggy Spring. A glazer's knife is another name for a putty knife. So is this a step backward or did someone not get the news that a hive tool has been invented? However a statement in the article mentioned beekeepers tend to use things that are readily available. In 1921, an article in the *American Bee Journal* showed similarities between the Arthur C. Miller hive tool and the 1907 Sawyer bee knife, as well as the J hook tools of today.

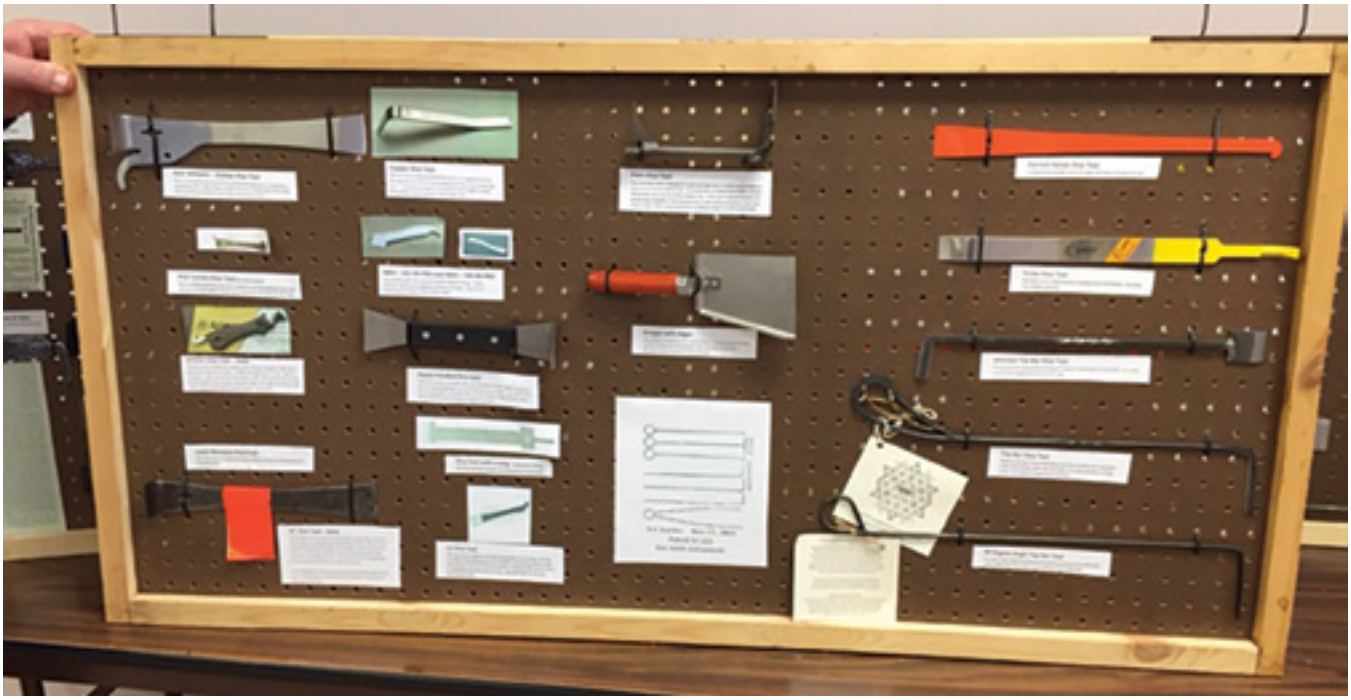
When I look on the internet at some of the beekeepers showing how to use a hive tool, I see they have three or four different types of hive tools but they prefer the J hook type. Most of these beekeepers doing the demonstrations live in Australia where the weather conditions are different. There isn't anything wrong with a good J hook hive tool, but you must make sure that you assembled your wood frames correctly as the hook can make short order of separating the top bar of the frame from the end bars. After years of use some of the frames may have become fixtures in the super and the pivot point of the J hook, makes an indentation in the adjacent frame's top bar while you are prying out a frame.

So we must take a short side trip and talk about frame assembly. Wood frames should be glued as well as being nailed together. The most important nail is the nail that goes through the end bar into the wood of the top bar that is left after the wedge has been removed. Since all the other nails go into end grain of the wood, the frame really needs to be glued. Staples do a good job of holding frames together as some staples reach 2½ inches in length.

If all you had to do was lift frames out of a hive, and you kept new frames in the hive, then the J hook hive tool is a good tool to use. But now we have a problem. Which J hook tool works the best? There are J hooks that have a right angle bend and J hooks that have an angle bend. You have to think, is it going to lift the frame or shove it sideways? My favorite blunder in the making of hive tools is the J hook hive tool that has a very short handle and the pivot point is in front of the hook. Not only is it uncomfortable to hold, but the pivot is in the wrong place. You wonder why people buy such an item. Either they wanted to show people what not to buy, wanted to have a pocket version, or looked at the price and wanted something cheap.

Don't buy a hive tool just because it is inexpensive. I have seen many hive tools that bend and break during use because the materials used were too thin or the wrong type of metal.

A slight variation of the J hook hive tool is the jagged edge hive tool and that takes into account the different widths of the top bars and spacing of the frames. I haven't



used mine, but it has a nice feel to it and appears to be made of thick steel. The main problem that I see is you don't have a 90° surface to hit with the heel of your hand to drive the blade in between supers. So I find that if I use a J hook or a jagged edge hook hive tool, I need to carry another hive tool for separating hive boxes.

Some people will get their hive tools from the local hardware stores where they find something that looks like a hive tool under categories of paint scrapers, pry bars, or molding bars. Again, these could be considered as hive tools and work okay, but have minor differences. The usual difference in most of these tools is that the taper of the blade is over a short distance to give the tool more strength from bending, but many have a problem inserting the blade in between the supers. The cast iron models may have a nail groove in the flat blade which will leave a mark if it is used as a scraper, but it is made of cast iron and the base of it can be used as a hammer. Since these tools are generally used to pull nails and pry things apart, they will generally have better defined nail holes and grooves and possibly the angle of the bend might be greater than a 90° angle.

Think of the nail holes that are put in many of the hive tools. Most of them are for appearances only as they have a large hole and two rounded cut outs for the shaft of a nail. Thus the only nails that one could pull would be the common or box nails that have a small enough head to go through the big hole in the hive tool. Then you would pick up the end of the hive tool and pull out the nail. You should use the longer end of the hive tool as a lever. I don't think I could pick up the short end, and if I did I wouldn't have much leverage or the pivot point is far away. So why have the second nail slot?

This brings us to the "regular" hive tool which has been around for years. When I started to keep bees, a seven-inch hive tool was offered by most of the bee supply companies in their beginning kits. There is nothing wrong with that, because everything was new and came apart easily. However over the years, things get propolized and you find yourself wanting a longer hive tool. So the standard became a 10 hive tool which may actually vary in length from being 9¾" to 10¼".

The "regular" hive tool might be stainless steel, spring steel, or high carbon tempered steel. It may be available in many colors which sometimes aids in locating the hive tool if dropped. I can visualize that some hive tools such as green could get lost easily in the grass. However as you use a hive tool and clean it up, the paint will be scrubbed off with frequent use, it often becomes shiny. When it sits around without being used, it may become rusty and a rusty hive tool is also hard to find if dropped. Some people believe that a chrome plated hive tool is the answer, but many times the plating of the tool peels off. I have found that if I take fluorescent orange duck tape and put on the hive tool that helps me locate the tool. If the tape becomes tattered or dirty, it can be replaced.

Some companies have started making 12" hive tools and longer hive tools which make it easier to separate supers but may give you a hive tool that is bulky to carry and a little too big for frame removal. Some hive tools will have plastic or wood handles which make it nicer to hold but give you a place that gets gummed up with wax, propolis, and honey. The addition of the wood or plastic may interfere with the pulling of nails and heating the blade for bending. There is a hive tool advertised as the strongest hive tool made and a very similar hive tool known as the Shizel. This type of hive tool is advertised to double as a nail puller, pry bar, leveler, chisel, hammer, can opener, and a trowel. It is a comfortable hive tool to hold and provides some distance between the bees and your hand. However I have found it to be bulky for fine work and to carry to many hives. The early models suffered overheating while being welded and thus many of them bent while being used separating supers because the temper had been ruined. To make a similar hive tool stronger, some beekeepers have used plate steel or car springs in creating real heavy hive tools to lug around.

To get the cleanest job of scraping wax and propolis off a frame, the blade of the hive tool should be vertical or at right angles to the wood. Thus it is common to use

the bent end of the hive tool. With time, that end of the hive tool becomes dull and needs to be sharpened. The beekeeper may use a file or a grinder to sharpen the edge, but eventually it gets down to about a burr on the end of the hive tool. The old timers would heat up the end of the tool and flatten out the bend and reform a new bend about an inch down the blade. This process was repeated until the nail hole came up to the sharpened surface. Many times if you tried to clean up a frame by pushing the straight flat blade along the top bars, the blade dug in, gouging the wood.

Sometimes I like to use two hive tools to lever frames out of the supers or to hold a super up while the other tool is used to pry loose the sticking frames. In levering out the frames, it works best if you can get a hive tool on either side of the end bars. A better technique might be to remove an outside frame and work your way across the hive using the open space to your advantage. It also helps prevent rolling the queen and other bees. When you have a frame out that has a lot of burr comb or deformed comb, it is a good time to straighten out those problems before or replacing that frame.

The influence of items like the Swiss Army Knife may have spawned the invention of combination tools. You may see a hive tool and a frame grip combination. They may look useful, but think about it. If you are prying something with the blade, it would be very hard to use the frame grip at the same time. Many times, one of the pieces of the tool just gets in the way of your activity. One of the latest varieties of these frame grip and hive tool combination, would need a lot of filing to get the edges sharp enough for me to use.

There are new tools on the market called the Kent Williams "Outlaw" hive tool and a similar Kiwi Combo hive tool from New Zealand that incorporate the J hook and the regular hive tools. These two tools appear to have great possibilities to work very well as the pivot point of the hook is higher than the hook. There are many combination tools of this type on the market, but these are knock offs and have the bend of the blade even with the J hook making it practically useless in using the J hook to lift frames.

For years many people have made other hive tools that have special appendages and bends to make it easier to do certain jobs and usually there are disadvantages to these tools such as the appendage tearing up the upholstery, your pants, or punching holes in your body. Sometimes the "new" tool will be over built so is very heavy to carry around. However there is an EZ tool that has special bends allowing the lifting of frames and a bent end that you could use to strike with the heel of your hand in separating supers.

I am sure that I have not mentioned all of the tools in my collection, I see hive tools on displays and in pictures that I used to have and I can't find them today. But most importantly, I see tools that were used in the 1860s that are similar to the Top Bar Hive Tools. Hive tools that were invented in 1907 that are similar to the J hooked tools of today and all kinds of variations of the regular hive tool of the 1920s have been carried on today. Beekeepers tend to use hive tools in the manner that they were taught and very few of them will change to another style. Certain hive tools work better for certain purposes and types of hives. I would suggest that you have at least two different hive tools so you can develop your own preference and in case a hive tool gets lost, you have something else to use until you can order a new one. The best hive tool is the one that works best for you. BC

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NOTES ON THE AMERICAN BEE RESEARCH CONFERENCE

Malcolm **Sanford**

In 1986 the first American Bee Research Conference (ABRC) met at the Baton Rouge Bee Laboratory. It was organized by two giants of apicultural research at the time, Joe Moffett of the Tucson, Arizona Honey Bee Laboratory (now deceased) and John Harbo retired from the Baton Rouge facility and presently heading up Harbo Bee Company **www.harbobeeco.com/vsh/**. The idea was to have an event to share early or preliminary research results in the form of abstracts that could then be further discussed by those attending. One attendee of that first meeting, Jose Villa, currently at the Baton Rouge Lab, remembers there were 24 presentations (abstracts) with six student presentations including himself, Keith Delaplane and this year's ABF keynote speaker, Dr. Marla Spivak.

Since that time the ABRC has met in many places, mostly associated with one of the annual national beekeeping association meetings. The abstracts have also generally been published in the American Bee Journal and other publications. The event is sponsored by the American Association of Professional Apiculturists (AAPA) **http://aapa.cyberbee.net/events/** The AAPA is an attempt to have a U.S.-based organization similar to the Canadian Association of Professional Apiculturists (CAPA) **www.capabees.com/**, which is considered one of the best organizations of its kind. For several reasons, the AAPA has never approached the success enjoyed by its Canadian cousin. Nevertheless, it has staked out a place and forum where members can come together to reflect on the current status of honey bee research. As such it met with the American Beekeeping Federation in Jacksonville, Florida in early January, 2016.

Over a period of two days, some 42 presentations were given by a combination of scientists, students and invited speakers. In addition, a poster session, business meeting and presentation by a multi-state program on honey bee health research rounded out the ABRC. Although there was no stated theme for the conference, it was obvious that the effects of pesticides on honey bees was on many minds.

The Keynote speaker was Dr. Geraldine Wright Institute of Neuroscience, Newcastle University, United Kingdom. With degrees in zoology and statistics Dr. Wright, a Professor of insect neuro ethology works with a team that is actively looking at neonicotinoid pesticide effects on behavior of bees. The "bees" moniker also refers to bumblebees, which often have varying behavior from honey bees. There is little question that "neonics" are found in the environment, but their specific effects are often not well understood.

Dr. Geraldine Wright

However, a wide range of behaviors are at risk from "relevant doses" of neonicotinoids, according to Dr. Wright, including olfactory learning and memory, navigation motor function, feeding, attraction to food sources, risk-taking behavior, taste perception, immune function, carbohydrate metabolism, and nutrient balancing. The research is also showing that damaging levels of these pesticides are found in both pollen and nectar.

Dr. Wright and her team are probing other areas of honey bee behavior. They are finding that the PER (proboscis extension reflex) is quite different in honey bees versus bumblebees. There is evidence that quinine inhibits response to sucrose (sugar) stimulation, that bees can taste neonicotinoids, in some cases preferring them to other materials, and caffeine can improve learning potential. We can look forward to further results from Dr. Wright and her team at New Castle University in the future via their web site **www.ncl.ac.uk/ion/staff/profile/jeriwright.html#background**.

A bonus for the convention was a second keynote presentation by Dr. Wright on how bees meet their nutritional needs. Using liquid food solutions containing the 10 essential amino acids and sucrose, her team has identified how adult worker honey bees and bumblebees balance their intake of amino acids and carbohydrates. Foraging worker honey bees require a diet high in carbohydrates and low in essential amino acids (EAAs), while younger, within-colony workers require a diet higher in EAAs. In contrast, foraging worker bumblebees regulate their intake to a diet very high in carbohydrates. We can look to more knowledge in this area as Dr.

Wright's team is now examining and comparing currently available artificial diets in honey bees.

In accordance with the history of the event, a number of topics reported at the ABRC were preliminary in nature, including looking into how *Varroa* mites feed using biostains via fluorometry, the role of queen mandibular pheromone (QMP) and retinue behavior influenced by *Varroa* chemical treatment, honey bee transcriptional responses to viral infections, and surveying Israeli Acute Paralysis Virus (IAPV) in honey bees and its impact on queens.

Pesticides were on the agenda beyond the keynote presentation, including effects of crop protection fungicides and nanotechnology-based pesticides on honey bees. A number of surveys of pesticides ("neonics" and others) found in the urban and rural landscapes were reported. Sub-lethal effects of "neonics," including queen fecundity

and colony development and how to monitor bee health in commercial orchards affected by these chemicals. One study showed that toxicity to pesticides is temperature dependent. Another revealed that simulated transportation of colonies alone increased the insects sensitivity to insecticides. Several studies looked at how honey bees fare in the urban environment. It was reconfirmed that simply moving colonies of honey bees will result in reduced weight gain.

The "holy grail" of much apicultural research continues, including looking at more effective chemical mite controls (Varroacides). Experiments using different substances such as fatty acids as miticides, and field efficacy trials of various biopesticides, were also reported.

Nosema research continues in a number of areas. The effects of pollen variety on honey bee susceptibility to Nosema infection are being examined. Fumagillin treatment is found to be deleterious to honey bee hemocytes. Diet also affects Nosema infection in several ways. Canadian information reveals that toxicity of fumagillin to humans is important because residues from the material in beekeeping equipment might pose a direct risk to the operator. Finally, new microscopic techniques are improving the ability to identify Nosema spores under the microscope and in the honey bee midgut.

Research on Africanized honey bees is affirming that hybridization between the African-derived and European populations is much more complex and asymetrical than previously thought. This was confirmed by looking at the relationship between aggression, metabolism and alele-specific expression in hybrids in the Americas.

Many of those attending the AAPA and ABRC by virtue of their common mission are also intimately involved with Project NC1173. Formally titled "Sustainable Solutions to Problems Affecting Bee Health," This is a research effort made up of the following states: IL, MN, PA, CT, OH, NC, MA, FL, AR, NY, GA, NH, ME, IN, TX, NE:

"The causes of honey bee and pollinator declines in the U.S. are varied, complex, and defy a simplistic explanation, as multiple stressors are almost certainly involved. Significant progress in identifying contributing factors to bee declines has been made by many current members of the NC1173 multi-state project through a $4.1M, four-year USDA CAP project that was funded in 2008 to study the causes of Colony Collapse Disorder (CCD) and other factors affecting bee populations. Current members are also part of the $5M CAP through the USDA Global Food Security program to establish the Bee Informed Partnership, an extension-only effort to collect and disseminate information about the health of the managed bee population.

"Many of the findings from these large collaborative projects were presented and synthesized at the Stakeholders Conference on Honey Bee Health convened by the USDA and the U.S. Environmental Protection Agency in October 2012. The summary of this conference provides a roadmap for future research to be addressed by members of the NC1173 multi-state project:

"The technical feasibility of the proposed working group is greatly facilitated by the existing practice of adjoining the American Bee Research Conference (ABRC) the annual professional meeting of the American Association of Professional Apiculturists (AAPA) with one of the three national apiculture associations in the U.S. in alternating years: the American Beekeeping Federation (ABF), the American Honey Producers of America (AHPA), and the Apiary Inspectors of America (AIA). This tradition of interfacing with the clientele and other professional groups concerning beekeeping is ideally suited to collaboration, interaction, and discussion of current problems that face the industry."

All entities above are expected to meet together next January in Galveston, TX. Look for the ABRC to continue its pivotal role in developing and sharing honey bee research information into the future. BC

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Wax Rendering

A Little Look Into An Aspect Of The U.S. Industry That Doesn't Get Much Attention

Ross **Conrad**

Rendering wax is a dirty job, but someone's got to do it. Pictured hand bailing liquid wax from the melting tank is Zachary Trescott (right) and hired hand, Kaleb Matthews.

Beeswax: This unique hive product is more valuable pound for pound than honey. Beeswax is used in candle making, waterproofing, soap and cosmetics manufacturing, pharmaceuticals, art, furniture polish, and more. Unfortunately, beeswax is often contaminated with debris such as dirt, bits of wood, honey bee cocoons, honey, dead bees, propolis, and more. While many beekeepers don't bother to save and collect wax from their hives, there are some backyard beekeepers that will take the time to render their wax by melting it down and filtering it. While such efforts are able to remove significant amounts of wax from the hive refuse, a lot of wax is lost and thrown out along with the dirt, cocoons, dead bees, propolis and other contaminants that make up the slum gum that is left over from wax recovery efforts. Large beekeeping operations typically don't have the time to render all their wax so they will sell their cappings, old combs and slum to a commercial wax renderer who has typically invested in thousands-of-dollars of equipment designed to efficiently clean and purify the beeswax. This small, often unnoticed, and mostly unappreciated segment of the beekeeping industry quietly goes about the business of rendering beeswax and while the work required to recover this valuable commodity from the hive is dirty and messy, thankfully some folks are willing to do it.

Most rendering companies are known to commercial beekeepers solely through word-of-mouth, but there are a few that advertise their services primarily through national beekeeping journals and the internet. One such company is Beelite Beeswax Recovery, run by third generation beekeeper, Tim Trescott and his family currently located in Burnsville, North Carolina.

For years Tim and his father, Stanley Trescott, ran about 800 hives between Florida and their home in New York State. In those days they only rendered their own wax, but their operation was wiped out when the tracheal mite spread throughout the U.S. during the mid-1980s. Stanley Trescott started a rendering business at that time figuring that there was a lot of business to be had as other beekeepers also lost hives to the mite and wanted to save their combs from being destroyed by wax moths.

While the hand-crank press that his father used for many years was adequate at the time, Tim felt that it was too much work so after getting some ideas from a fellow beekeeper, Lavern Prettyman of Florida, he designed his own hydraulic presses using old freight train pistons. Although he didn't have bees to move any more, he still spent Summers in New York and Winters in Florida so he eventually set up wax rendering operations at both ends of his yearly migration route. In 2002 he started a candle making business, Beelite Candles, in New York, and then ended up retiring from wax rendering in 2005, selling off his Florida and New York rendering businesses to other beekeepers. After a few years his candle business plateaued, so he built himself some new wax presses and began to offer rendering services again in 2012 out of his home in Burnsville. Tim will render wax and return the wax to the beekeeper for a small, per-pound fee, do the job for a percentage of the wax, or pay the beekeeper for all the wax recovered during rendering.

Beelite Beeswax Recovery utilizes a large melting tank partially filled with water to melt down beeswax cappings, combs and slum gum collected from beekeepers throughout the country. The melted mess is then hand bailed into bags which are placed in the presses. He uses four hydraulic presses to separate the wax from the other debris before pumping the wax through a one micron filter

Tim Trescott and two of the hydraulic wax presses he built using old train pistons.

The Trescott clan from left to right: Adam, Tish, Tim & Penny Trescott (holding Anson), Hannah, Zachary, Meaghan, and Emily (holding Mckinzi).

at 60-70 psi. "We've done beeswax for 25 years and we've learned a lot in 25 years," says Tim.

Beelite Beeswax Recovery is able to remove practically every bit of beeswax from the slum, old combs and cappings that he collects, netting on average about 25% of the original weight of the slum in wax. While his beeswax operation typically renders about 50,000 pounds of beeswax in a year, Tim says he is a small operation and that there are somewhere between one-to-two dozen operations scattered around the U.S. that do the bulk of the rendering for the U.S. beekeeping industry. Many of these operations are located in and around the Dakotas where the bulk of America's bees spend their Summers.

While one of Tim's biggest challenges is finding sources of old combs and slum to process, he is encouraged by the growth potential of the business, since far too many beekeepers throw away, burn, or compost their old combs, hive scrapings and slum gum. As Tim puts it, he would like to grow enough to have some influence in the industry. One idea he had when he started up in North Carolina, was to contact all the local beekeeping associations in North Carolina, along with neighboring Tennesee, Virginia and Georgia and encourage them to start collecting wax and slum from their members. He would be willing to do all the hauling, collecting all the wax and slum that they could come up with and then pay the associations around .35 cents per pound for it. The money could go to help the associations. With approximately 30,000 backyard beekeepers in North Carolina today, Tim estimates that none of the slum gum the beekeepers produce currently receives further rendering and as a result, hundreds of tons of beeswax is being thrown away simply because no-one is willing to put it aside, store it and keep the moths out of it. He would like to make rendering for backyard beekeepers his niche, since the larger rendering companies don't want to deal with such small amounts but so far he hasn't found any bee clubs willing to collect and store the slum their members produce. "People think that it is not enough to bother with, but they need to realize that they are throwing away money," says Tim.

Located in his garage/barn, Tim says that having the rendering operation on site works out well. "In the morning when I get up, I try to get out to the wax plant by 7:30 and get the boiler running. Zachary (his youngest son) comes in around 8am and by then we've built up a head of steam and things are ready to roll. But by the middle of the afternoon, after lunch, all four presses will be loaded, they'll have the cooker reloaded for the next day, and then we're just waiting for the presses to finish pressing so we have a little bit of free time. We can come and go, or run downtown if needed and we don't have to be here and babysit things all the time."

Beelite Wax Recovery and Beelight Candles is a family business. Besides working with Tim rendering wax, his youngest son Zachary maintains the Beelite website (**http://beeswaxrecovery.com/**). Tim's wife, Penny, is their quality control person. Meanwhile Tim's daughter, Emily, pours most of the candles in the basement of their home, though Tim's youngest daughter, Hannah, assists her and specializes in making their tea-light candles. Emily has been making candles since she was eight years old and took over the majority of the family's candle making work about two years ago after graduating from high school. This freed Tim up to focus primarily on the rendering side of things, although he still handles the Beelite Candle invoicing and associated administrative duties.

Emily produces, packs, and ships everything from votives and tea-lights to holiday and nature themed candles, as well as hand-dipped tapers. She also ships out blocks of bulk wax and makes a line of soy wax candles which allows the family to offer a line of colored and scented candles since the soy wax handles coloring and scenting better than beeswax does. Tim is finding that the two businesses, Beelite Beeswax Recovery and Beelite Candles complement each other nicely and he is now selling all the beeswax he can render about as fast as he can produce it.

Sometimes the wax that Tim is able to remove from slum is very dark. According to Tim he can lighten up the darkest wax by re-running it through his filters to remove the "organic matter in it that won't settle out and is impregnated into the wax. By running it back through the filtering system we take a lot of that dark matter out and start to lighten it back up. We can actually turn black wax yellow." Tim goes on to explain, "That is one of the things that fascinates me about beeswax, it can be as black as your hat and we can still turn it yellow, not with harsh chemicals, but by filtering." In order to produce a consistent product, beeswax that is still quite dark even after repeated filtering can be blended with lighter colored wax.

Sometimes the dark wax will have an unpleasant smell. "Although we can change the color of it and turn it back to yellow, I can't remove the smell. My wife has the

The Beelite candle display.

final word on quality and we can be running nice cappings wax and she might still say, 'but that's got a funny smell to it,'" explains Tim. However, the scent of the wax has a lot to do with its source. "If it's coming from cotton honey in Louisiana for example, it will have a stronger smell, even though it may be 100% cappings wax. So we have to have it fairly close to premium grade to pass her nose and before we use it for candle and bulk wax orders."

Last year around the middle of the Summer, I began filling a 55-gallon drum with the slum gum and hive debris that remained after melting down cappings, hive scrapings and broken combs in my home-made solar wax melter. Of the 70 lbs of slum and comb remains that I delivered to Tim and his crew last Fall, an additional 20 pounds of beeswax was recovered from the contents of the drum. I have to confess that I never realized how much beeswax I was burning, composting or simply throwing away. During the past twenty-plus years of beekeeping, I had always thought that there was not enough wax left behind to bother with after running it through my solar wax melter. You can bet that from now on I will be saving all the slum that comes out of my melter and paying Tim another visit some day in the future. BC

Ross Conrad is the author of Natural Beekeeping, Revised and Expanded 2nd edition. Ross will be presenting at the 2016 West Virginia Master Gardener Association's Conference in Greenbrier County at the State Fair Grounds in Fairlea/Lewisburg on April 15-17, 2016, ***2016wvmgconference@gmail.com****, and leading an Organic Beekeeping class for beginners May 7-8, 2016 at the Metta Earth Institute in Lincoln, Vermont. Call 802-349-4279 for more information or to register for the May class.*

PROPOLIS

Healing Throughout History

Stephanie **Bruneau**

What is propolis?

Most beekeepers are all too familiar with the sticky, resinous 'bee glue,' propolis, lining the inside of every honeybee hive. You can scrape and scrape all you want – the bees will just replace it! Every tiny gap or drafty crack in the hive will be sealed with propolis, which also coats the hive entrance, walls, and even the honeycomb. But in addition to making hive inspections stickier, propolis serves several crucial functions in the honeybee hive, and has been been recognized as valuable by humans throughout the ages.

At once providing structural support and sterilizing action, propolis has been called both 'bee glue' and 'bee penicillin.' It is strongly anti-bacterial, inhibiting the growth of any bacteria, fungus, or other unwanted microbe that might thrive in the warm and humid hive environment. In fact, the word 'propolis' is derived from the Greek 'pro' (in front of, at the entrance to) and polis (community or city), meaning 'before the city' or 'in defense of the city' (ie, the hive). Bees also use propolis to contain potential pathogens brought in by mice and other hive intruders. These intruders will be killed by the bees, and their carcasses mummified in propolis to prevent their decay from degrading the hive environment.

The bees make propolis from tree resins that they collect from leaf buds and tree sap. Worker bees collect the resins and carry them back to the hive on their legs in their pollen baskets. Perhaps because the resin is so sticky, the worker bees cannot unload it themselves (unlike pollen), rather, they have to have another bee unload their bounty for them. The bees mix the collected resins with wax, honey, and enzymes from their stomachs to turn it into the amazing and ever-useful substance that we know as propolis. The end composition is ~50% resins, 30% waxes, 10% essential oils, 5% pollen and 5% plant debris, although each hive's propolis is a bit different, based on the variety of unique resins collected from a given hive's local trees.

How is propolis harvested by the beekeeper?

To harvest propolis, the beekeeper places a flexible plastic screen with cracks on top of the frames in the hive, underneath the hive cover. The fastidious bees will quickly work to seal all of the cracks with propolis. This plastic screen can be easily removed by the beekeeper and placed temporarily in the refrigerator or freezer - the propolis, which is soft and sticky in the warm hive, will quickly become brittle in the cold. Flexing the screen easily cracks the brittle resin off of the screen where it can be collected.

How has propolis been used by people – past and present?

Propolis has been used for health and healing since ancient times - at least since the time of Aristotle (384 – 322 BC), who is actually said to have coined the word 'propolis' himself! Taking advantage of its antiseptic qualities, Ancient Egyptians used propolis to embalm cadavers. In ancient Greece, Aristotle (384 – 322 BC), the physician Pedanius Dioscorides (40 – 90 AD) and Galen (129 - 217 AD) prominent Greek physician).

In ancient Rome, the naturalist and author Pliny the Elder (23 – 79 AD) used propolis extensively. In his famous *Natural History*, he wrote that "*propolis is produced from the sweet gum of the vine or the poplar, and is of a denser consistency, the juices of flowers being added to it. Still, however, it cannot be properly termed wax, but rather the foundation of the honey-combs; by means of it all inlets are stopped up, which might, otherwise, serve for the admission of cold or other injurious influences.*"[1] Pliny also wrote that propolis "*has the property of extracting stings and all foreign bodies from the flesh, dispersing tumours, ripening indurations, allaying pains of the sinews, and cicatrizing ulcers of the most obstinate nature.*"[2]

The ancient Jews also considered 'tzori' (the Hebrew word for propolis) to be medicine, and tzori is mentioned throughout the Old Testament.[3]

In more recent times there has been a significant amount of research on the biological activity of propolis, and many of the healing properties that so many civilizations have touted in propolis throughout the ages have been confirmed by modern day science. Research has demonstrated its anti-bacterial, anti-fungal, anti-viral, and anti-inflammatory properties, its ability to protect the liver, to increase the body's natural resistance to viruses and infections, to heal problems of the mouth and gums, and to treat peptic ulcers (among

[1]Bostock J, Riley HT, editors. Pliny the Elder, the Natural History, Book XI. The Various Kinds of Insects. London, UK: Taylor and Francis; 1855.
[2]Bostock J, Riley HT, editors. Pliny the Elder, the Natural History, Book XXII. The Properties of Plants and Fruits. London, UK: Taylor and Francis; 1855.
[3]The Bible. Jeremiah 8, verse 22, Jeremiah 46, verse 11, Jeremiah 51, verse 8.

other attributes). At least 180 different compounds have been identified so far.

Today, propolis is used as a popular remedy. Current sales of propolis in the United States are estimated at 40,000 lb/yr. Because of its long and varied list of touted benefits, the range of uses is long and varied in home remedies and body care products. It is available in capsules, as an extract in alcohol or glycerin, as a mouthwash, and can be found in many creams and cosmetics.

Recipes!

You can make your own products from raw propolis very easily! You can collect propolis using a propolis trap as described above, or you can scrape small amounts from the edges and sides of your hive components.

Raw propolis can be easily infused into a topical cream or oil, a liquid (propolis extract), and can be purchased at your local natural foods store in capsule form as well. Together these products are an amazing defense system at your service, with an ability to assist your body with healing and germ fighting.

Propolis Infused Oil

Of all methods of infusion, research indicates that an oil extract of propolis may have the strongest anti-microbial effect. Applied topically, propolis oil is soothing and healing on cuts and abrasions. Propolis infused oil can be used as an ingredient in lotions or salves, and can work wonders on areas of skin irritation or severe dryness such as psoriasis or eczema.

Materials

~10 grams propolis scrapings (about 1 TBS)

7 oz olive oil (other oils can be used, such as apricot kernal oil, sweet almond oil, etc.)

Method

Mix the propolis and oil together in the top of a double boiler. Use a thermometer to monitor the temperature and heat the oil to no higher than 122°F (as higher temperatures may destroy some of the beneficial qualities contained in the propolis). Stir and heat for at least 30 minutes, and up to four hours. The propolis will not all dissolve.

Strain this mixture through cheesecloth or a paper coffee filter. If you use cheesecloth, you may have to filter the oil twice. The propolis that remains in the filter can be used again to make more oil – refrigerate or freeze it for another time. Store your finished oil in a sealed jar in a dark place.

Keep in an amber dropper bottle, and store in your medicine or kitchen cabinet.

Propolis Tincture

Mix two parts propolis by weight to nine parts of clear grain alcohol, by weight (we use 75 proof or higher vodka, or Everclear) (Do not use ethanol alcohol – it is poisonous!).

Mix together in a lidded container, such as a canning jar. Shake. Store in a dark place. Shake two to three times a day for one to two weeks. Strain through a cheesecloth or paper coffee filter, and store in a dark place or in a dark jar. You can collect and store the propolis left in in the filter, as it may be reused for another tincture or oil (store in the fridge or freezer).

Keep in an amber dropper bottle, and store in your medicine or kitchen cabinet.

Herbal Mouthwash

Use this as a rinse after brushing at night, and keep the dentist away!

3/4 cup water

1/4 cup vodka

2 dropperfuls calendula tincture

2 dropperfuls echinacea root tincture

1 dropperful myrrh tincture

2 dropperfuls propolis tincture

1 drop peppermint or spearmint essential oil (I actually like it better without this! But others who are used to a minty flavor enjoy this optional addition).

(Note that the essential oils and calendula, echinacea and myrrh tinctures can be found in a natural food store.)

Honey Propolis Throat Spray

Spray in the back of the mouth anytime sore throat hits! This powerful spray can be great to prevent bacterial throat infections such as strep throat.

- Mix three TBS of propolis tincture (see recipe above) with two TBS of raw local honey and one TBS of warm water in a spray bottle. The propolis tincture can be combined with other herbal tinctures as well for their immediate relief and longer-lasting benefits in the face of illness; our favorites are echinacea, marshmallow, ginger and/or elderberry tinctures, all of which can be found in a natural food store. BC

Stephanie Bruneau is beekeeper, mom, herbalist and artist. She runs *The Benevolent Bee* selling honey, candles and beeswax-based body care products. She is a co-founder and of the Boston Area Beekeepers Association.

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Bostock J, Riley HT, editors. Pliny the Elder, the Natural History, Book XXII. The Properties of Plants and Fruits. London, UK: Taylor and Francis; 1855.

Beeyard Thoughts

If you keep bees, you will be stung.
Seasonal management is not what it once was.
Odds and Ends – The bright future of hive heaters.
For the Brand New Beekeeper – Don't fret too much about stings?

The Inevitable sting

Last season, I went to my bee yard to set up an observation hive. This one was needed for a Saturday school program. It needed to be set up on Friday morning and broken down late Saturday evening. I was using a nuc to supply the bees and queen.

How hard could it be to find the queen and move one frame over to a single frame observation hive? I could be in and out before the bees knew it. *(This story's ending is so predictable.)* With such a small hive on an early Spring day, why would I need anything more than a loose veil? As you are expecting, this little hive instantly killed me. I barely had the nuc opened before I was taking hits. I worked faster – as did they. I took even more stings. Experienced beekeepers know the routine. In these situations, everything stops in mid battle – except the beekeeper – and he/she makes a fast retreat, leaving the hive in disarray. First priority is to get away from the bees and secondly to get the protective gear and smoker that should have been in use in the first place. In a bit, with smoker blazing, I returned to the hive, fully armed, and won the war. The observation hive, sporting a marked queen, went to the grade school and was a hit – as usual – and was put back into the hive later Saturday afternoon as planned. Note that I used protective gear to put the bees back into the colony.

Why am I telling you this little story? As beekeepers, we all have similar tales of bees being forced to remind beekeepers of the basic rules of hive entry. I broke the rules, and the bees rebuked me. It really wasn't terrible. I took about 10 stings, but I was expecting none, so 10 was entirely too many.

As I was taking the stings and dealing with the small hive, I was aware that I was alone with the hive and could deal with the situation in ways most comfortable to me. What if someone else had been there – say a visitor not well known to me? Would I have reacted in the same way? Probably not. Therefore, I postulate that there are two types of stings – those taken publicly and those taken privately, and they are not the same.

Private Stings

Private stings are the stings with which you must contend when you are alone or with another beekeeper who has already seen it all. These are the common stings of a beekeeper's life. These are the ones where you say your special little phrases or words and get on with things. These are occasionally the ones where you smash the offending bee and throw smokers, all the while talking to yourself and to the bees. These are the stings that build up your sting immunity and increase your confidence in beehive management.

But in the early years of beekeeping experience, these can be frightening stings. *"Is there a bee in my veil?"* If no one is around to help, you must decide if, in fact, there is a bee in your veil. If you pull the veil around to look, no doubt you will pull it open at the throat and only make things worse. Private stings prepare you for public stings – both psychologically and physiologically. Obviously, learning to take stings privately is far easier than learning to take stings publicly.

Public Stings

Why in the world would I ever take stings in public? If you keep bees long enough, rest assured, that one day, you will be in a situation where you may be stung before people you don't know. At that moment, you have both your reputation and the reputation of the beekeeping industry in your gloved hand.

Right up front, I need to say that there is no glory in a *run-away* stinging episode. You don't appear brave or tough to non-bee onlookers, but rather may look like someone all together unhinged. On the other hand, if you are the only one who is wearing protective clothing while the crowd is in harm's way – again you don't look tough or brave, but cowardly. What to do?

If you are working bees in public, each case will need to be evaluated on its specific merits. Use common sense and reasonable protective measures. Two primary issues are at play: (1) observer safety and (2) apicultural respectability.

Observer Safety

I'm wandering too far afield from my primary topic, but any time

The honey bee's defensive sting.

you are working bees in public, the safety of bystanders is paramount. For instance, many years ago, I was called to the Auburn University central campus to pick up a swarm. Immediately, a crowd gathered and began to shout the requisite questions from afar . . . (*Are you getting stung?? Where's the queen?? Are they making honey??)* Though the bees seemed docile and manageable, I was still uneasy about the ever-encroaching crowd. What to do? If I admonish the crowd to back up, I leave the impression that something dangerous is on going; yet by not warning them, I become responsible for extraneous bees flying about within the crowd. What else could I do? I told them to back up and give me and the bees room to work. They did and the story had a happy ending; however, I did take one public sting – but with grace and dignity.

Apicultural Respectability

Though clearly second to *Observer Safety*, maintaining control of your bees in public is the primary requirement for apicultural respectability. While working bees in a cage at a hypothetical farm show, which of the following scenarios leaves a better impression:

a. While pulling out a frame, you take a sting in the hand, while grimacing, you grab your hand, drop the frame, and make some comment like **Wow!** That hurts! Bees begin to fly all about the cage. Rest assured that no one in that crowd is going to become a beekeeper; plus, they consider you to be a curious sort for being in the cage in the first place.

b. While pulling out a frame, you take a sting in the hand. You lean the frame against the colony, walk to the cage screening, and show the sting still attached to your hand. You make comments like, *"This is a bit painful, but not excruciating."* And you assure people that beekeeping training makes managing bees uneventful – for the most part.

In the second scenario, beekeeping looks like something that might be enjoyable and you look professional. What is not in evidence are all the sting gigs you danced and the peculiar things you did in private while learning to take the occasional public sting. Tolerating stings and learning to control your response takes time and a personality type. Who knows? All your stings may be commonplace.

For the Beginner

Though our pain levels vary, we must all learn to deal with bee stings in our own way. Initially, there is no harm whatsoever, in smacking, jumping, shouting, and even running so long as you regain your composure and complete the hive manipulation with some degree of control. Some hives are worse than others, some days are worse than others, and some beekeepers are worse than others. I have a few stories where rowdy beehives were left open for several months until the bee inspector came and reassembled the hive components.

There are variables everywhere in learning to accept stings with aplomb. But if you keep working bees, you will gain experience and confidence. Take your time. There are no beekeeping gold stars for rushing your early years. Gain your confidence. Wear protective clothing as long and as often as you want. Indeed, some beekeepers have worn heavy protective gear their entire career. Do whatever you must to make beekeeping enjoyable for you.

Seasonal management – the *"filler"* topic

Very much like the articles describing how to cut dovetail joints in nearly all monthly woodworking magazines, each issue of most bee magazines seems to have an article on some old or seemingly new idea that explains how to *"manage"* your colonies. One reason that this subject is so common is that it *is* important to aid the colonies and subsidize them in any way possible. It's tough out there for the bees.

Before mites, it was simple. Divided into seasonal bites, presenters could go by the numbers and tell inexperienced beekeepers how to support the colonies during their seasonal times of need. It was a useful topic, simple to find a presenter, and easy to transfer information. It was a great filler. The invasion of parasitic mites into our beekeeping industry caused huge changes in our management schemes. In fact, the changes are still evolving. Fluvalinate strips (not used as much as they were) are not used in the same manner as oxalic acid. Both require separate management recommendations. And then there are all of you and your personal management needs and beliefs.

Somewhere around the middle of the 1980s, beekeeping and its related management schemes was forced to evolve and change – dramatically. Even today, we beekeepers do not have a good handle on ways to suppress parasitic mite populations and other related disease problems. Suddenly, a gaping hole appeared in our management knowledge base. Nothing was for sure anymore, so it must be okay to try something different. Whereas before,

Wintering bees need moisture and humidity – but not too much.

beekeepers could choose from ten-frame equipment or occasionally some eight-frame stuff, now there are options that are all over the beekeeping page. In an effort to do something, most of you discarded the common solid bottom board in favor of the screened bottom board. This new device certainly did not hurt, but neither has it been a great help. I use them. You do, too. Interestingly, after a hundred years of use, the traditional bottom board had to be renamed the "solid" bottom board to be sure it was not confused with the screened bottom board.

So here we are today. We manage bees in a multitude of different hive styles and with a second multitude of procedures and recommendations that are suppose to put the mites in their place. Maybe not for others, but for me, a discussion of seasonal management is complex. The ways we keep our bees and the equipment we keep them in is much more diversified.

I have the same problem with miticides. Some of you will use absolutely anything to control mites, while others use a little something. Then there are those of you who use nothing chemical to control mites. There are even a few of you who use nothing at all to control mites. When presenting to a diversified audience, the subject of mite control has to be divided into parcels. When the topic is seasonal management, the same now appears to be true. Though more confusing and challenging, this diversification of procedures and equipment is good for the evolution of the bee industry. In future articles, I hope to offer some specific comments that will help to describe the modern management of bee colonies. We are all in a learning mode.

Odds and Ends

If allowed, I speculate that beekeepers will soon have some kind of hive heating system – probably something to do with the bottom board. Outside of beekeeping, it seems that nearly everything is evolving, changing, and simplifying. Heat sensing cameras are nearly affordable. Every one now seems to have a sport camera that can be used for nearly anything. Beeyards are increasingly Wi-Fi accessible with related apps for monitoring colony activity. I find this all good for the future of beekeeping.

New beekeepers with their diversified knowledge base bring fresh ideas to our industry. Engineers of all types are now occasionally beekeepers. I'm not at ground zero, but a few such technically trained people have contacted me with their prototypes (and confidential) designs that they feel will be useful for supplemental heat within a wintering colony. Even if the first few fail, we will grow from the experience. It is an exciting time to be a beekeeper. BC

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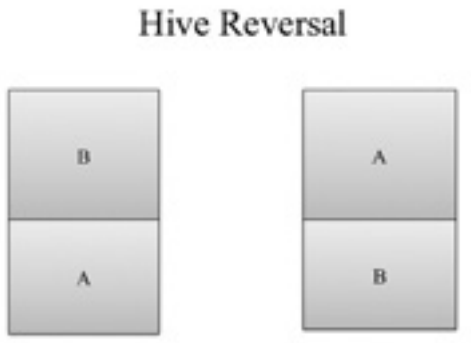
SWARMS

What are they and what can beekeepers do about them?

Jennifer **Berry**

Ahhh. Spring is finally here. No longer are we dealing with grey, dreary days, cold freezing rain, drying wind chills, ice coated windshields, scratchy wool clothing, high electric bills, shattering teeth and low esteem. No more and what a welcome change.

Spring – the season between Winter and Summer. The season of rebirth, birds chirping, warm days and cool nights. The season in which dormant seeds, bulbs, and buds respond to the surrounding sun-soaked soils and burst forth, exposing daffodils and tulips, red buds and azaleas, violas and more. The season in which frogs and toads, crickets and katydids awaken and fill the air with an orchestra of mating calls. The season the bees are finally able to fly, forage and find food! The season that beekeepers, gardeners, hikers, bikers, runners, writers, painters, and lovers love! The season that . . . bees **SWARM**! Tulips and Pansies and Swarms. *Oh My*!



To some, (the bees) swarms are not so bad, but to others (the beekeeper) it sucks. To bees, swarms are a way of life – actually a way to continue the life of the species. In a nutshell, a honey bee swarm is the process where around half of the bees (on average), along with the old queen, split from an existing colony to form a new one. Once the bees leave the original colony, numerous things can occur. The queen – with all the bees in tow – will fly a certain distance from the hive and land on a branch, wall, post, leaf, car, stick, bush, another hive, rock, or boat. Once she has landed, the swarm of bees will surround her, forming a moving mass of bees. They will remain at this location until a) a new home is located or b) a better branch, wall, post, leaf, car, stick, bush, another hive, rock, or boat is found. While in limbo between homes, scout bees will be combing the landscape for another suitable dwelling. Once this is accomplished, the scout bees will fly back to the swarm and through the dance language, explain to the rest of the bees and queen where their new home is located. And then, off they will fly to begin again.

Hopefully, their new residence will have available space for expansion, along with providing insulation and protection from the environment. Plus – hopefully – there will be an adequate nectar flow so they will be able to store enough food to survive the upcoming winter dearth. Unfortunately, less than 25% of swarms survive their first year. It's sad to think that so many bees die each year, not only from mites and starvation, insecticides and environmental toxins, but also due to swarming.

It is important to recall, though, that swarms are necessary for the survival of the species. If swarming didn't occur, then the first-ever colony of bees, once it died off, would have also been the *last* colony of bees. But, because there is not only internal reproduction (the queen laying eggs) but also external reproduction (swarming), the species survives.

So, how does swarming figure into the equation for the beekeeper? Swarms are usually something we don't want since more than half of the bees and the queen leave the hive. And beekeepers especially don't like swarms if they are planning on harvesting honey that season. In the perfect world – and what's best for the bees – the honey crop should be large enough as to not only sustain the bees through months of minimal forage and frigid winter days, but also there should be enough so that the beekeeper can harvest and extract some for friends, family, customers and/or themselves.

Now, sometimes we are lucky and can "hive the swarm" if the queen lands in a convenient and easy to reach location (not on a branch 200 feet in the air).

But what really sucks about swarms, especially for queen breeders, is when their prized queen, (the one they've been collecting data on for the past few years; the one they are about to graft from to produce more queens), flies away – or as we seasoned beekeepers like to say, she "hits the trees."

One of the largest swarms I ever saw was in the top of an old pine tree. It broke my heart because in the middle of that massive, unreachable swarm was one of my favorite queens that I was only days away from grafting from. If only I had a bucket truck, she would have been back inside a comfy hive. Instead, she flew away several days later – never to be seen again.

Over the years, our bee lab receives numerous calls during the Spring months about swarms – from frustrated beekeepers to nervous public folk who are afraid to go outside due to the massive ball of bees that has just formed on the post of their front porch. If we have time, which we **rarely** do during Spring, we will make an effort to go and collect the swarm (if it's close and attainable). If not, we get them in contact with a beekeeper that has the time and energy. Some of the more memorable swarm calls have been the ones in cars – especially the brand new convertible Mercedes at a dealership, the ones near a school or playground that were going to "kill the children," the one at the post office which delayed the mail from being delivered, and – my personal favorite – the one at the Harley Davidson dealership.

I have to tell you about the swarm at the Harley

dealership. I got a call – I was told there's a swarm in a small tree about six feet from the ground, just outside the door of the dealership. The gentleman on the phone seemed calm, but did ask if someone could come immediately because the bees were scaring away customers. Quickly, I grabbed my veil, smoker, brush, bucket, lid, step ladder, complete hive and a spray bottle full of sugar water and headed out. When I arrived, I immediately noticed the swarm. It was in the *perfect* location: hanging off of a thin branch. I thought to myself, '*This should be no problem at all.*' As I began to gather my supplies from the truck, a very large – very intimidating – man walks up to me and says, "Excuse me little lady, are you here to deal with those bees?" I responded, "Yes sir, I am." He looked disappointed, shook his head and then said, "Oh, I see. Why would they send a woman?" Honestly, I didn't know what to say, so I just laughed and said, "No, they sent a beekeeper – and I'm all you got."

As I began to head toward the swarm, he followed me. I placed the ladder into position, and stepped up to lightly spritz the bees with sugar water, when I suddenly noticed that there was a crowd of about 20 folks who had gathered outside the dealership. I also noticed the 'intimidating guy' was behind me, just feet away, watching my every move. I explained to him that he might want to step back; that swarms are usually very calm but sometimes they can be unpredictable – especially when they get shaken off a branch. They may just fly and sting the first thing they come into contact with, possibly even his face. He said loud enough for the entire crowd to hear, "I ain't afraid of no bees. Plus, they sent a woman to do a man's job." With a wave of his hand and an exasperated puff of air expelled from his lips (as if to imply that I was annoying him), it was obvious he wasn't concerned about the bees and wanted me to continue; so I did just that.

I know I shouldn't have, but something deep down from my inner core made me.

As I continued to position myself and the bucket I said "There is one more thing you should know: these bees could be 'Killer Bees,' which means this entire cluster, all of these thousands of bees, could take off and sting you and me, and those people by the door. Maybe you should join them, just in case the bees get too aggressive, and head inside if I give the word." Meanwhile, a few foragers had returned and were starting to fly around his uncapped head. He nervously responded, "How can you tell if they are… 'Killer Bees'?" I replied, "I won't know for sure until I shake them into this bucket." Just then, that's what I did. I shook the branch and all the bees fell into the bucket, and I yelled, "KILLER BEES!"

I've never seen someone take off so quickly. I even heard a high shrill come from him as he ran into the door while trying to open it. Once he was inside, the crowd that had gathered burst into laughter. I quickly put a lid on the bucket and headed back towards the truck. Meanwhile, the manager of the store approached me. He shook my hand and thanked me for retrieving the bees, and also for helping to teach his employee to be more of a gentleman. We laughed and I informed him that I was going to leave a small hive (with a frame of old comb and a queen lure) in the tree where the swarm had been. This will hopefully attract any stragglers or foragers that I was unable to collect in the bucket. Then, I would be back at sunset to collect the hive and – hopefully – the remainder of the bees. Leaving bees behind sometimes can cause an issue; I wanted to make sure there wasn't going to be, since this was '*a man's job.*'

So, how can we prevent swarms? Well, that's the million dollar question with a two dollar answer: we can't really.

Bees are going to swarm. It's in their nature as much as it's in our nature to eat, drink, and breathe. So, preventing swarms really isn't what we want to attempt; instead, how about we try to reduce swarming? Below are some methods that we have used at the UGA Bee Lab, and in my own personal bee operation, over the years.

Here in the southeast, we begin preparing for swarms as early as December or January, even though, on average, we usually don't witness the first swarms until March. However, depending on whether the winter weather is above or below average, this may shift that date to February or April. Being prepared is the key to being a good beekeeper.

Several things can occur which trigger bees to swarm. One is the increasing day length. Once the days start getting longer, the queen usually begins to lay eggs, and since she is laying eggs, populations begin to rise, thereby crowding the bees. Also, as the queen continues to lay more eggs, eventually there is a lack of available laying space. Plus, as the bees become more and more crowded the queen pheromone is inadvertently diluted. Next, add a nectar flow and *BAM!* You have the perfect storm for a swarm. All of these things, whether occurring individually or collectively, can trigger the mass exodus of bees from the parental colony, so, again, we need to be prepared.

As I mentioned, we actually begin our first swarm preparations in December or January. It's called **hive reversals**. As the bees are going through winter, they are slowly moving up through the honey stores (which is why it is imperative to put honey stores *above* the cluster of bees and *not* below). As they move into the honey supers, they may vacate the boxes below. And, as the population of the colony continues to grow, they begin to bump their heads on the underside of the inner cover or lid, feeling even more cramped. Reversing hive bodies is a simple – yet very effective – method of taking empty boxes from the bottom and reversing them to the top just above where the bees are clustered. But, only do this if there is NO BROOD in the lower box. Otherwise, you will separate (split) the brood into two different locations, and the bee population may not be strong enough to cluster over both areas. Hence, unprotected brood will die (see *Figure 1*).

After hive reversals, winter progresses into spring and bee populations are reaching a maximum, so all of the hive boxes may be full. Another way to reduce or postpone swarming is by adding more boxes, or supers (supering). This is especially important to do once the nectar flow begins. Another common practice, especially with commercial operations, is to re-queen. As the queen ages her **QMP** (Queen Mandibular Pheromone) production slows down or is limited. The reduction of QMP in the colony can cause workers to begin to raise queen cells either for supercedure or swarming. By replacing the old queen with a newer one, it may help to reduce or prevent swarming.

Another method, one we do with our research colonies which can't be allowed to swarm (otherwise we lose data), is to cut queen cells. This method is *extremely* time consuming when you have more than a few colonies, and it may not always work. The idea here is to cut cells every seven days, since the bees are rearing new queens in preparation for swarming. Remember, the old queen leaves with the swarm usually just prior to the queen cells being capped. Usually – but not always (there are very little absolutes when it comes to bees and beekeeping). If you decide to cut queen cells, you must be on time (every seven days) and inspect *every* frame, along with every nook and cranny, because if you leave just **one** cell, they will swarm. Over the years, we have cut thousands of cells, keeping hundreds of swarms from happening. It's important to remember, though, that if the colony is already in swarm mode, it is going to swarm no matter what you do.

The last method – my favorite, and, in my opinion, the most effective swarm reducing method – is creating an artificial swarm by splitting the colony yourself. This method needs to take place in the early spring months, just prior to swarming (construction of queen cups). To do this, the old queen and several frames of bees, brood, honey and pollen are removed and placed into a separate nuc box and then transported to a different apiary. The remaining parent colony is given empty drawn or undrawn frames to fill the space, a queen cell, a new queen, or is allowed to rear its own. The new colony is still susceptible to swarming, so give them plenty of space by placing them into a 10-frame box and adding a super. Depending on the quality of the old queen, she may be replaced as well.

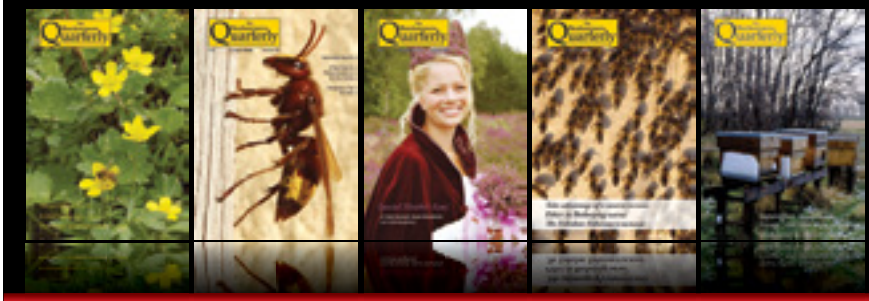
I hope one of these methods works for you. I've tried so many, and have *yet* to find one that is foolproof.

Spring is an exciting time of year – not only for the beekeeper, but also for the bees. Even though I am losing bees and queens, I love to watch swarms. There's something magical about the energy of so many bees hitting the air at once; it's hard to describe. Imagine what it must be like for the bees. What do they feel, leaving the comforts of their home? Launching off and branching out without any security or guarantee that they will find a new home, or a solid patch of flowers, or enough nectar to supply the energy to build comb, raise brood, produce honey, and survive until the next spring. Maybe the comfort of having all their sisters and mom swirling around them, knowing they are helping the species to survive and the excitement of the unknown is enough to keep them going. But, who knows. I guess only the bees do!

Be good to you and your bees! BC

Jennifer Berry is the Research Director and Chief Beekeeper at the UGA Honey Bee Lab.

Photos by Ben Rouse.



BIGGER PICTURE

Jessica **Louque**

It Is Written

During the 2011 EAS conference, I attended a workshop called "Making Pysanky Eggs" with Carolyn Fluehr-Lobban. I've always been interested in Ukrainian eggs but never had a chance to try it. I had a blast in the class and completed my first egg (bee themed, of course!) to take home with me. After that, I decided to foray into the wilderness of egg decorating on my own.

For those of you who may be wondering what Pysanky has to do with bees, the creation of an egg is only possible by using beeswax in a batik method. Batik is called wax-resist dyeing and is only created with beeswax. Basically, you use wax in an area of fabric, or in this case, eggshell, to resist color change to create patterns. Then, you heat the wax to melt it off your medium and show the finished product. Pure beeswax must be used to decorate the egg, and not just for traditional eggs. Although originally it was the only form of wax that was readily available (Psyanky dates back to pre-Christian), there are logical reasons to use beeswax. Most of you guys probably know that beeswax candles are better than all the other candles because they are so pure that they suck impurities out of the air, and they have a higher melting point because they last longer. In this instance, the purity keeps the egg clean because other waxes (like paraffin, for example) have trace oils that can smudge, damage, or completely ruin the dye or pattern on an egg. Also, the higher melting point is much safer because you have to either use an electric kitska* or a traditional kitska, which is heated over a candle flame to melt down the wax enough to draw designs. A lower melting point causes a higher likelihood of explosion. Nobody wants exploded wax on their face (or anywhere else, really). *The kitska is the implement used to draw the wax on the egg. It's basically a stick with a copper funnel attached by copper wire. Different sized funnels indicate the size of the wax line that will be drawn.

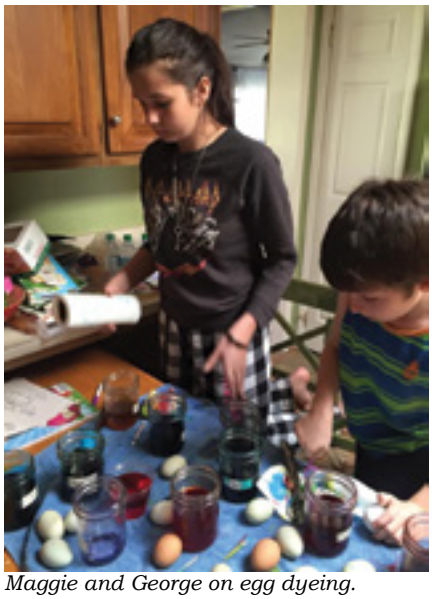
For about the last 1,000 years, the pysanky egg has been associated with Easter. The women of the household would make them for friends and family to be blessed by the priest at Easter, and then they were given out. As with most Christian traditions, pagan rituals were incorporated into the conversion to help with the transition. Originally, the eggs still had religious meaning, but were associated with the sun god. Eggs also hold a lot of myths and superstitions, but are always a sign of life. A family would make sometimes up to 60 eggs during the Lenten season to give away at Easter.

Each egg was created specifically for the recipient, with certain patterns and colors that were meant to bring the most good fortune. Darker colored eggs were given to older people because they had lived so long, while eggs with more white or brighter colors were given to younger people because their life book wasn't written yet. Eggs were not just made for friends and family. The barnyard would receive at least one or two, the bees would get at least one to ensure a good honey flow for the next year, and the chickens would get one back in the nesting boxes to encourage the hens to lay. Eggs with spiral designs were thought to trap demons for all eternity and keep a house safe. For deceased family members, eggs were put in the casket at the burial of the person. During lent, eggs were made for the graves of family members, and a few extra were made in case of the death of a family member within the

Halfway through the Chinese New year dragon.

Cleaning the wax off the Chinese New Year dragon.

Louque-style Pysanky eggs by the kids.



Maggie and George on egg dyeing.

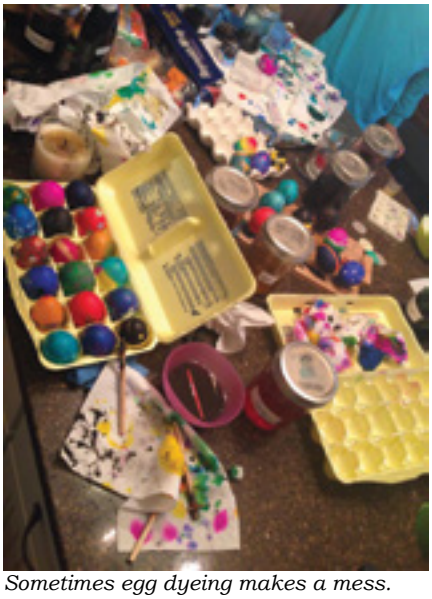
next year. Most of these eggs would be made in mostly black and white to symbolize respect for the souls of the dead and mourning.

While in a lot of ways I am a traditionalist, I also like the idea of adding some modernity to something like this that is creatively driven. I like the thought of giving something to loved ones that represents your hope for their wellbeing, and I like the personal touch that comes with a gift made specifically for someone. I can appreciate the hard work to create an egg, but I'm sure you'll agree that the point in time where you switch from a traditional kitska to an electric one is the day you support a change to modern times. Occasionally there is also the fear of incorrectly using a symbol or a color group that really shouldn't go together, but that's a bit along the lines of a superstition – if you don't know it, then it doesn't affect you or mean anything.

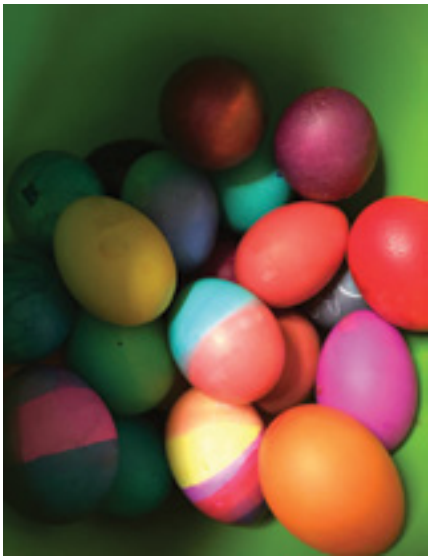
In 2012, it was the Year of the Dragon for the lunar New Year. My friend Xiaoyan gave me a really cool fish design cutout on red paper that was supposed to bring luck for the upcoming year. She also fed me some authentic Chinese food that she made by herself. I wanted to give her something to start her new year that matched the theme, while giving it a twist to make it a unique gift. This seemed like a good time to try out my Pysanky skills in a non-traditional manner. As a present, I made Xiaoyan an egg that had a symbol of the dragon as the main artwork, with a black dragon on a red background. This is typically an abhorrent color choice because they two together symbolize unrest or unease, but are perfectly fine in Chinese culture.

The past couple years, we have decorated Easter eggs with the kids, but merged the traditional Pysanky with the usual egg dyeing. The Pysanky dyes are brilliant colors that are meant to last; a nice change from the chalky pastels that accompany Easter eggs. The kids all enjoy dyeing in a Pysanky style with the bright colors too, but it can occasionally cause some accidents. Last year, Charlie wasn't paying attention and knocked a full mason jar of electric purple dye across my mom's kitchen. It's mixed with vinegar to make it hold better, and let me tell you – it's not called dye for no reason. That was some frantic cleaning to get it up before it stained every visible surface. The skin and clothes contact was a lost cause, but everything else was salvaged enough to not notice purple to the untrained eye. Other than the occasional spills, we have a good time with the eggs. Maggie likes the traditional Pysanky a little more than the boys, but also possesses the ability to perform acts of creativity with hot wax and dye (the boys might not have that skillset). In traditional Pysanky, eggs are either left whole for the interior to eventually dry out, or may be poked and have the egg blown out. In our Easter eggs, they are hard boiled for the safety of the egg and the kitchen floor. There is another form of Ukrainian egg dyeing called Krashanky where you dye the egg one color after boiling it to eat for Easter. I like to think we are just combining the two traditions into one Louque family spectacle. We probably veer off the Krashanky course around the time that the egg hunts devolve into a rampant egg attack in a take-no-prisoners war.

I am hoping with Maggie getting older that she will enjoy the Pysanky tradition enough to learn the traditional methods of creating eggs. It's a little exciting because it's one more tradition we can do together as a family, but a little more time as a Louque ladies activity. Let's be honest – with four guys in the house, it's nice to do something sometimes that the guys aren't even interested in seeing (safer for us, the eggs, the dye, and the surrounding surfaces). My goal is to slowly build up as she gets older in creating eggs for the most important people in our family's life, and making a holiday tradition that adds excitement to Lent for the anticipation of Easter, as well as including our loved ones in the tradition. Our family, as far as we know, doesn't have any roots in the Ukraine, but we are hoping to be able to alter just enough of the process to make it special to our family and make it our own. Being able to use a product from our bees while creating a gift that takes thoughtfulness, time, and energy is a great way to connect with our favorite people in a way that is unmatched in personalization and love. Hopefully, the kids will learn how important thoughtful gifts are that don't necessarily cost a lot of money, but will be cherished for its meaning for years to come. BC



Sometimes egg dyeing makes a mess.



Finished Louque kid eggs waiting to be hidden for Easter.

A Conversation With Florida's David Westervelt

Larry **Connor**

In September, 1976 I drove from Columbus, Ohio to Lehigh Acres, Florida as a step toward moving the Dadant and Sons, Inc., bee breeding program, producers of the Starline and Midnite Hybrid bees, from Hamilton Illinois to Labelle in south Florida. As part of that program we had the objective of having a dozen insemination stations that would facilitate the mass production of hybrid queens using insemination devices. Once the program was up and going (but never at the level we hoped) we drew in the attention of beekeepers from all over the world. We had visitors from all over the United States, Europe, South America and even Australia. I wish we had kept a guest book for all the visitors, but never expected to be such a traveling beekeeper destination.

Two of those visitors were from Umatilla, FL, then a sleepy community north of Orlando, known as a center of beekeeping for both Florida and northern beekeepers. One of the visitors was Buck Collins, a schoolteacher who ran about 500 colonies. He brought with him a young man of 14 who owned and managed 100 colonies of bees at that time. His name was David Westervelt.

Westervelt was born 11/11/62 in Orlando. His great grandfather brought bees from Georgia to Florida, and David started studying bees when he was six and he bought his first two hives when he was 10. He rapidly expanded his colony numbers, and by the time he left for the Army, he had 125 colonies. His father took over management of the bees and, stationed in Germany, David used his time off from the Army to visit local beekeepers. He was impressed with the level of professionalism among the beekeepers there. While the colonies were just starting to get *Varroa* mites, the beekeepers were well educated and making a solid fight against the parasite.

Many of the beekeepers he visited liked to play with their bees. They managed bees in small sheds and on trailers. Many were well educated and were treated with great respect. Even the 10-colony hobby beekeeper had an excellent knowledge of bee biology and colony management.

It amazed David that the many hobby beekeepers had extracting houses that were food-grade facilities. As a small producer, they had an exceptional facilities designed to maintain a wholesome product. The beekeeping supply house had everything from homeopathic medicines to the newest gadgets. They had aromatherapy products, propolis products and even explanations of homeopathic uses of honey. And gadgets, these beekeepers had possibly every little gadget known for use in beekeeping.

During his first tour to Germany, David met Ursula and they were married. Of note to those who are interested in beekeeping trivia, Ursula is from the same hometown as Professor Al Deitz, the retired bee research scientist from the University of Georgia, Athens.

When David got out of army he worked nine months hunting for a job. Then started working for the state of Florida as a part-time seasonal worker. Then he was hired by Florida State Apiary Inspector Laurence Cutts.

During his first year on the job beekeepers experienced a product failure with the Amatraz Mitacure strips. Cutts was trying to figure out what was causing the failure. So about 1994-95 Cutts put Westervelt on the project to assist with research on the product.

After working about two years on the product, the Florida Agricultural commissioner assigned Westervelt to a position in Career Service, which then turned into a position as an environmental specialist that allowed Westervelt to work on any one of a number of issues. That was about 18 years ago.

They determined that the failure with the Amatraz product was due to a breakdown metabolite that was deadly to young honey bees. During that time they were testing a new mite treatment that included Checkmite (coumophos). In 14 months we were able to push that product's registration through.

By 2000 to 2002 the focus was on the newly discovered varroa resistance to Apistan and the discovery of the small hive beetles. These discoveries were quickly followed by the discovery of resistance of the American foulbrood spores to terramycin (oxytetracycline).

David also worked on the miticide Apigard (Thymol) but it took almost six years to get the material approved. It turned out that it was a lot easier to get registration with a harder chemical compound than one with a softer biological footprint.

David explained the next set

David and Ursula Westervelt met while David served in the Army in Germany. Ursula and David help with the University of Florida Bee Colleges run by Dr. Jamie Ellis, and Ursula works to make sure the snacks and lunches are ready for the large number of participants.

Putting out fires, coordinating a staff of regional bee inspectors, and working with the staff in the Department keeps David busy – his cell phone never stopped until he turned it off get other work done!

of adventures this way: "It was quiet until 2006 when CCD was reported. Thanksgiving day we were working with Dave Hackenburg's bees – colonies that had not grown after making splits. At the time we were calling it Fall dwindling. Then the name was changed to Colony Collapse Disorder at the 2007 January National meetings We were mainly working with Jerry Bromenshenk (Montana), Gerry Hayes, and Dennis van Engelsdorp (Pennsylvania). We also worked with USDA labs that came in for testing. At that point I was the go-to-guy. The then Florida Apiary Inspector Gerry Hayes and I sat down in his office and suspected that it was a result of multiple causes, of multi-factorial origin, a term that Jeff Pettis used."

Then David found himself in a California beeyard with over 40,000 colonies, or what was left of them. He looked at two cows on the hill and called them Happy Cows, while when he looked at the bees he called them Unhappy Bees.

The Media hit. Getting up at all hours to meet film crews, being interviewed by Katy Couric for Network TV.

To this day David feels that CCD is caused by Viruses, Nosema and Nutrition (and other pests). The Nosema harpoons the midgut of the bees and provides access for virus entry and injury. The fungicides, pesticides and herbicides were small pieces, but do have a direct linkage.

Then Gerry Hayes left Florida. About a year before Gerry left, a supervisor had retired and David took that position. He went from being an environmental specialist to being an apiary inspector. When Gerry left, he was put in as an interim assistant chief Apiary Inspector. Five months later, May 2011, he was put in that position full time.

Key Accomplishments

Working with the state's beekeepers, they were able to get the statute changed for backyard beekeepers so it is now legal to keep bees in non-agriculture areas, such as backyards.

Riding the boom in the number of new beekeepers after the media publicity about CCD, the number of registered beekeepers in Florida has increased from 1200 to 4000 beekeepers, an amazing growth.

Colony numbers boomed too, growing from 240,000 to 500,000 registered colonies. Registration is required in Florida, starting at $10 and reaching a maximum of $100 for an entire operation. Beekeeper/bee colony growth has been observed at all levels of beekeeping, from commercial, sideliner to backyard beekeepers, something he calls niche pollinators.

The number of bee clubs exploded too, growing from having six local clubs to 45 local clubs, maybe 50. There are two Florida groups: Florida State Beekeepers Association (www.floridabeekeepers.org) and the Florida Backyard Beekeepers (www.floridabackyardbeekeeper.com). Both have 600 to 1000 members each. Folks in southern Florida understood the value of having a group of backyard beekeepers while not trying to minimize the commercial group.

Personal Thoughts

David is a big man, like me. He literally held my head up when I collapsed at the Caribbean Bee College last year in a fainting episode, an event hopefully to be avoided in the future by a pacemaker I had installed a few months later. He knew what to do because he has had a series of heart issues. So he is concerned about his weight, his heart and staying alive. He is no longer the tall, skinny kid I met in Labelle, Florida during the 1970s.

When David was in the Ninth grade, he was asked what he wanted to be in five years – he was already a beekeeper – so he said he wanted to be a bee inspector by the time he was 30. He did that. Then he wanted to be the head bee inspector by the time he retired. He has accomplished this too.

Thoughts About the Future of Beekeeping

David is sure that by using single drone insemination and selection of a queen's lineage, bee breeders will be able to accomplish a great deal of selection to reduce disease and mite susceptability. He sees the use of genetic manipulation to help control mites.

"The old time beekeepers are always asking for the next strip," David said. "I think we are going more toward IPM (integrated pest management) and getting away from chemical dependency. Now beekeepers are farmers and are part of agriculture. In 30 years we will be just beekeepers, not in agriculture and not in veterinary medicine."

"The most important thing we can do is educate the young kids, do the fairs and public exhibits" (In the past I have visited with David while demonstrating aspects of bees and honey at Disney World's Epcot.). "You never know what that kid will do in the future," David said.

Changes in Beekeeping in Florida

I left Florida in 1980 to move on in my world. David has remained in the State, except for his time in the Army. So I asked him the following question:

"When you started in beekeeping, what was beekeeping like?"

"It as the heyday of beekeeping," he said. "Once a year we had to treat for American foulbrood and that was about it. We would make up new colonies, after palmetto, to make new splits. We set them around the forest around here in north central Florida and let them plug down. In December we would work to get them ready for orange blossom. We

would make a good crop. Out of one hundred hives we would only lose one or two. We never bought queens – we would make 28-day splits (making sure there were eggs). If they did not have a queen, we put them back on other hives. We ran singles and kept the queen under a queen excluder. We never took the Summer honey (scrub palmetto (sable), palm honey, asters, Spanish needle, goldenrod, smartweed, yellow primrose willows). At that time we did not go to Brazilian pepper or melaleuca.

"At that time, where we were located around Umatilla, in the 1980s we had about 2,000 beekeepers and about 480,000 colonies in Florida. Nearby there was one street, about a four-mile distance, and there was a beeyard every tenth of a mile during orange blossom. We had 11 beekeepers on that road (keeping bees) and four that lived on the road."

"Today, there is one beekeeper who lives on that road. There may be six yards of bees on that four miles. The yard sizes are 96 to 240 colonies because they have gone to four-way pallets. We ran up to 700 hives by hand operation."

"One commercial beekeeper went to Bobcat about 1968-70. In the 70s two more got skid steer. Now we do not have any hand operated beekeeper except for the sideliners."

"The primary commercial beekeepers are still in the same parts of the state, along the center part of the state (along the ridge), those in the panhandle – tupelo beekeepers. A few are in Ft. Myers and a few on the east side of Lake Okeechobee. Only three or four beekeepers are in the southern parts of the state in the Palm Beach, Miami and Homestead area."

"What has really changed in the past dozen years is that we have beekeepers keeping much larger numbers, many up to 12,000 colonies. Two are over 20,000 and are having problems."

"Horace Bell gets Bunch bees and blows out bees into all new equipment. He has mechanized the entire operation and is always in battle with Adee Honey Farms for who is the county's largest producer."

"Horace runs a semi as one unit. Everything on that semi is equal. He pays attention to the important things. If you have mites you have a problem and you need to get rid of them. You cannot fight Mother Nature."

David expanded on the floral sources for Florida beekeepers, saying "We usually see some pollen around 7 December from maple, but not in large amounts until equinox.

Willow starts then in southern part, but not until February in this north central area."

"Orange blossom 7 March nectar begins and usually continues until 15 April. About 15 April for gallberry would come full bloom. In the past we would average 120-130 pounds."

"What changed – they found titanium and mined for it, ruining the gallberry woods. They also found that pine straw is an excellent material for landscaping and started herbiciding all the lower story plants to make it easier to collect the pine straw."

"Now in Florida there are 13 major nectar crops: orange, gallberry, palmetto, mangrove, Brazilian pepper, titi, tupelo, tallow, kudzu, maleleuca, sea grape and fall bloom from goldenrod and smartweed. If your hives are around a housing area, you will make crop of honey from the first of Spring to first frost. Probably annuals and woody ornamentals (Indian hawthorn, holly's, palms palmettos)," David said.

Starting With Bees

"To start with bees now, look at what used to be, get a mentor, do a little book reading and see how it has changed. Now get on the computer, get information, having the extension service with master bee programs and 70s-like extension programs (pointing to me as a former extension apiarist.)"

"There is a saying: A mentor is a beekeeper that likes to talk and listens to Mother Nature."

"It is unnatural to put chemicals in a beehive. Now we are using insecticides in bee hives, with insects. Why is the genetic answer so difficult? Because beekeepers want an instant answer, immediate feedback! And we are the ones who use to teach beekeepers to make their own strips of fluvalinate and treat their own bees. It is not a natural thing for a beekeeper to do." BC

Contact: David Westervelt, Assistant Chief of Apiary Inspection; 352.395.4633, 352.395.4624 Fax; **David.Westervelt@FreshFromFlorida.com**

Dr. Connor gets a few weeks off in April and May but will pick up activity in June with visits to the CT Beekeeper's Association 125th anniversary meeting, a meeting with the Eastern CT Beekeepers, a field day with the PA Mann Lake branch, and as speaker at the Virginia State Beekeepers Association.

Got A Question?

Ask Phil

Phil **Craft**

He Knows!

Send your questions to Phil at
phil@philcrafthivecraft.com
www.philcrafthivecraft.com

A beekeeper in Kentucky writes:

I am going to get started as a beekeeper this spring. A little overwhelmed by the choices of hives, but as I really don't want anything too heavy, I am concerned about my ability to lift heavy boxes. I'm intrigued by the option of eight-frame equipment to lighten the load.

What do you think?

Phil replies:

It is quite true that hive boxes can be heavy – especially for people with lifting restrictions. Some beekeepers and beekeeping supply companies advocate eight-frame equipment as a solution to this problem, but I don't believe that it is the best one. For a simpler suggestion, read on.

In early Summer and late Fall, when food stores are at their maximum in preparation for Summer dearth or overwintering, the top deeps may be nearly full of honey. At those times, they can weigh as much as 90 to 100 pounds. That is a challenge for many people, so it is not surprising that both new beekeepers and folks who have been doing it for a while are looking for alternatives. What makes your question especially relevant, and creates a marketing niche for bee supply companies, is the changing demographics of beekeeping. Once a male dominated vocation, it is now attracting many more women. Participation in my most recent beginning beekeeping class was evenly divided between men and women, a ratio which is fairly typical in the classes I teach. That would not have been the case thirty years ago. At the same time, I'm seeing more grey hair in the audiences I speak to. For whatever reason, beekeeping seems to appeal to people who are a little older. The youngsters in my classes are typically in their 30s, and many new beekeepers are retirees, with the rest falling somewhere in between. Lifting limitations are often an issue both for women and mature beekeepers, as well as for those like me with a history of back problems.

In order to reduce weight and make hive management less arduous, bee supply companies sell, and some beekeepers purchase, hive bodies, honey supers, lids, and bottom boards, all designed to hold eight frames instead of the traditional 10. The smaller hives do weigh less, though possibly not enough less to alleviate the problem, and the reduction comes with a tradeoff. An eight-frame hive body, full of honey, weighs about 20% less than one with 10 frames, but that means lifting 70 to 75 pounds off and on each hive with each inspection. That's still a lot of back strain. On the other hand, during periods of peak brood rearing, honey storage in the top box is confined primarily to the outer two frames where the queen typically does not lay. In an eight frame hive, only six frames remain available for brood rearing as opposed to eight in a conventional hive. That's a reduction of 25% in the colony's capacity to grow. Another consideration is that eight frame hives are non-standard equipment, which will restrict your choices should you decide to buy or sell used equipment.

An alternative strategy for keeping weight down is the use of medium boxes, or even shallows, as brood chambers. Typically, three mediums replace two deeps. However, a fully loaded medium can weigh up to fifty pounds, which will still feel heavy to some. Using shallows as brood boxes reduces that to 25 or 30 pounds per box, but four are required to equal the volume of two deeps. That means forty frames to remove and replace during complete hive checks instead of 20. I fear that many beekeepers will not have the patience to go through so many, leaving them no better off than ones who use 10-frame equipment and find the top box too heavy to remove for inspections. Neither scenario is consistent with good management practice. Using shallow boxes for both hive bodies and supers also requires scrupulous marking or record keeping to avoid confusing the two functions. Frames which have been used in a brood chamber, and potentially exposed to most chemical treatments for *Varroa* or other pests, should never be used subsequently

Lifting heavy hives. (Mary K. Parnell photo)

in a honey super. In a conventional hive, size is function and the issue does not arise.

Though the use of either eight-frame hives or small boxes as brood chambers has some drawbacks, both methods are perfectly acceptable when combined with good management practices. But why make things complicated? My preferred strategy for handling heavy hives is both simple and cheap. The idea isn't mine originally; it was shown to me by a beekeeper friend, a woman small in stature and older in years who managed 40 hives and never had a problem with lifting. Her solution involved keeping an extra deep box on hand whenever she worked her hives (always a good thing have around anyway, for housing either a captured swarm or a top feeder.) As she removed frame after frame from the top deep brood box and found them heavy with honey, she would place them in the empty box instead of immediately returning them to the upper hive body. She could continue examining and moving frames until the upper box was light enough to lift off easily, whether that meant transferring half the frames or all of them. After inspecting the bottom brood frames, she replaced the top box and returned the rest of the frames to their original location. All this took no more time than it takes me to perform an inspection by lifting the top box off intact.

Keep in mind that the upper brood boxes are not always packed with food stores. At seasons when they are partly empty or contain more brood than honey, you may be able to lift a full deep box without difficulty. There are also occasions when limited hive inspections are sufficient – involving just the removal of a few brood frames from the top box to check on the presence of eggs and larvae – without the need to look in the bottom box at all. However, when a thorough inspection is required and weight is a problem, I recommend the empty box method. It works with honey supers too.

A beekeeper in Ohio writes:

I live outside of Columbus, Ohio, am a second year beekeeper, and have MUCH to learn. We had a recent warm day, warm for early February, about 50 degrees, AND THE BEES WERE FLYING from my two hives. I am VERY pleased.

My question is: When can I open the hives, and see just what is going on in there? It stands to reason to leave them alone, after all it is Winter, but it was warm enough for them to fly this week.

Thank you in advance!

Phil replies:

Your question applies to those of us managing hives in the middle zone of the country where Winter visits every year but gives us occasional respites. It's also relevant for beekeepers in the North where Winter is unremitting but spring, when it comes, makes a few false starts before settling in. In the South, the issue doesn't come up. Here in Kentucky, our weather is similar to Ohio's. We have also been experiencing occasional glimpses of spring-like temperatures, with highs well over 60°F. But, as you say, it is Winter. Seasonable cold weather will return. Honey bees tighten their cluster when temperatures drop below 50°F, and I am always concerned that too much manipulation will disturb it and cause damage to the colony. Though the days may be warm, nighttime temperatures can easily drop into the 30s or lower. However, like you, I get very curious about just what is going on inside my hives this time of year.

Under these circumstances, before I open a hive, I consider exactly what I hope to accomplish. If I were to discover a problem such as a queen-less hive, I would not have a replacement queen available. If I found a weak colony with only a few frames of bees, I couldn't reinforce it by adding frames of brood – I don't have them to move – and combining hives would require more manipulation than I would ever consider at this time of year. That leaves me with two clear goals: assessing cluster size and checking food reserves. Both must be managed with as little disruption to the colony cluster as possible, *i.e.* without removing frames. I do this by what I call "popping lids."

On a sunny day, with a temperature of at least 60°F, I remove the lid and outer cover. By looking down between the frames and taking note of the number which appear to be covered with bees, I can estimate the population in the top box. I then lift the top brood box off. Its weight will give me an idea of the amount of food which the colony has to sustain it through what's left of the cold weather. A heavy box reassures me that the stores are ample. If it lifts off with little effort, I know that I need to do some emergency supplemental feeding. Typically, by mid-Winter most of the food stores in the bottom box have been consumed, and the bees are very dependent on what remains in the top. While I have the top box off the hive, I look in the bottom to get an idea of how many bees are there. By mid-Winter the cluster has often moved entirely into the top box, so I am not concerned if I don't see many in the

Popping the top. (Mary K. Parnell photo)

bottom. Having gained all the useful information I can without moving frames, I reassemble the hive.

The purpose of such a cursory inspection, aside from satisfying curiosity, is to assess conditions that you can do something about. While it's too late to help a weak hive, lots of bees in both the top and bottom boxes is an indication that a colony will build up rapidly come Spring. That means bees in the trees (swarms) if the beekeeper is not prepared. On the strength of a recent lid-popping hive check, I placed an order for queens for making early splits and nucs. I will also make sure that I have enough woodenware, including frames with wax or foundation, at hand. A lack of food stores can be remedied immediately. If the upper box is light, I add a Winter sugar patty purchased from a beekeeping supplier. Bee candy, or fondant, is another option. Bee candy is a super saturated sugar syrup, produced by boiling, which forms a solid at room temperature. Cooks will be familiar with fondant used for icing and cake decorations. Bee candy is the same thing without the addition of food coloring or flavoring. It can be laid on the top bars of the hive, or poured onto a special inner cover while warm and placed over the top brood box after cooling. Inside the hive, the moisture produced by the cluster softens the candy making it easier for the bees to consume. Even granulated sugar sprinkled over the inner cover will be ingested by the bees and provide some emergency calories. The best winter food is the one which you have on hand and can get into the hive before the weather gets too cold to reopen it. (*Bee Culture* readers: I have written about emergency Winter/early Spring feeding in past issues. Contact me, and I will send you copies of these columns, as well as a recipe for making bee candy.)

Reserve serious inspections for the onset of more consistent spring like weather, which can occur in our region in mid-February, but is typically in March. In some years (2015 was one of those) I can't really get into my hives until April. The extended weather forecast, and not the calendar, must be your guide. Experienced beekeepers develop a feel for when conditions are right; beginners tend to prefer specific rules. For them, this is what I suggest. Look for periods of several days with highs in the 50s and 60s, and lows in the high 40s or 50s. A sunny day with temperatures in the 50s will do to open hives, but if conditions are cloudy or windy, wait until the thermometer reads at least 60. There is no point in pulling frames until it's warm enough to manage any problems you may find, and disturbing the cluster too early can be harmful. Real Spring weather, not the odd warm day, is the time to remove frames, examine brood, verify that the queen is present, and begin springtime beekeeping. Definitely postpone any manipulations involving the rearrangement of frames or hive bodies until the threat of freezing temperatures is past.

A friend asked me in February if she was a bad beekeeper because she didn't look in her hives during a recent warmup. In the late Fall her colonies had been strong with plenty of honey stores, so I reassured her. Good winter preparation is the key to successful over wintering, and in February there's not much that can be done if a problem arises. However, if you're unsure about Winter food stores or just can't wait to see inside, it's all right to take a careful look. BC

All The Buzzz in...

Hello Friends,

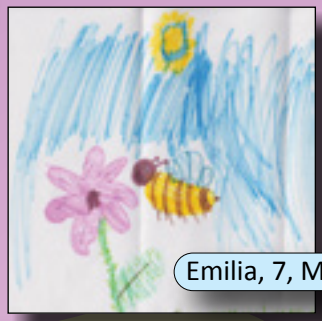
May you bloom beautiful and bright.

Bee B.Queen

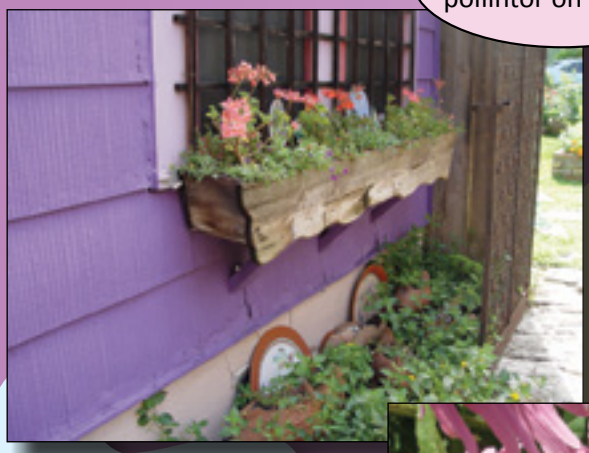
Bee B. Queen Challenge

Take time to watch a pollintor on a flower.

Sidrah, 5, MN



Emilia, 7, MN



Attracting Bees to Your Garden

There are a number of things you can do to grab the attention and meet the needs of pollinators like honey bees, native bees, butterflies, and hummingbirds. You can spend hours observing these tiny creatures eating, drinking, building cocoons, collecting pollen and enjoying your garden.

Plants Bees Love
- Daisy
- Aster
- Sunflowers
- Coreopsis
- Cosmos

Plants Hummingbirds Love
- Bee Balm
- Hollyhock
- Foxglove
- Honeysuckle

Plants Butterflies Love
- Purple Cone Flower
- Goldenrod
- Black-eyed Susan

Purple Cone Flower

Water

All living things need water. Insects are no exception. There are many ways to provide water for wildlife. Make a birdbath using a large plant saucer. Put a few rocks sticking out of the water to use as bee stepping stones. Make a small mud hole for bees and butterflies to drink. Some solitary also need mud to build their homes.

Food

Flowers provide pollen and nectar that bees need to survive. Bees love flat, shallow blossoms while hummingbirds love trumpet shaped flowers.

Planting Tips

Plant groups of the same plant together. A variety of plants will attract a variety of pollinators. Besides, different plants provide a well-balanced diet. Let some weeds grow in your yard. Dandelions are a perfect springtime diner for bees giving them pollen and nectar when they need it the most. Cut the weeds after they have reseeded.

Black-eyed Susan

Take the Challenge

Be a part of the Million Pollinator Garden Challenge. Register your garden at millionpollinatorgardens.org.

The bees need the flowers and the flowers need the bees.

... Bee kid's corner

Produced by Kim Lehman -www.kim.lehman.com
www.beeculture.com
April 2016

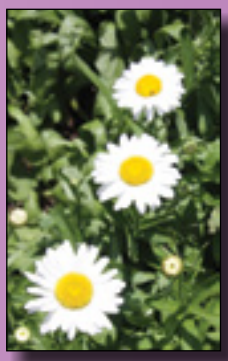
Unscramble the tiles to reveal a message.

B E	S .	R S	T H E	S A	O W E	W E R	N E E
N D	N E E	D T	T H E	H E	H E	~~F L O~~	B E E
D T	~~E S~~	~~F L~~					

	F L						
				E S			
F L O							

Butterfly Bush

Bee Balm



Daisy

What Do I Really See?

Create an optical illusion of a bee on a flower.

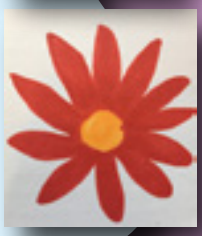
You Will Need

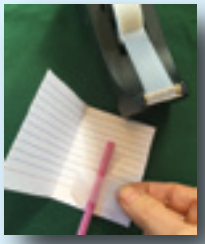
* index card (3x5)
* markers
* drinking Straw
* tape

Directions

1. Fold the index card in half. The fold will be on the side.

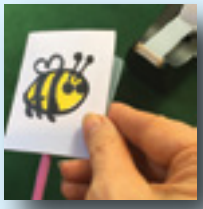
2. Draw a bee on one side and a flower on the other. Fill in the outlines with solid color.



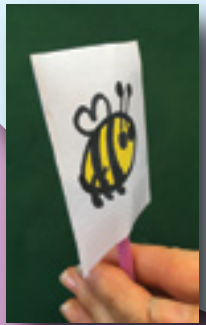


3. Open the flap. Tape the straw inside the card.

4. Tape the flap closed on all three sides.



5. Hold the straw between the palms of both hands. Twirl very quickly by rubbing your hands back and forth. What do you see? Are your eyes playing tricks on you? The best view is at eye level about eighteen inches from your face.



How it works. When you flip the picture quickly you can actually see two pictures at once. Your eye can hold on to a picture for 1/30 of a second after the image is gone. If you flip it fast enough your brain retains the flower and bee long enough to blend them together.

Beecome a Bee Buddy

Send two self addressed stamped envelopes and the following information to: Bee Buddies, PO Box 2743, Austin, TX 78768.

Name
Address
Age
Birthday Month
E-mail (optional)

We will send you a membership card, a prize and a birthday surprise!

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

DOWNTOWN

What About The Zika Virus And Plans For Mosquito Spraying

I have to credit one of our most impressive new(-ish)bees, Ted Mcginn, for first asking this question of our government bee-regulating person: "What about the Zika virus and the plans for mosquito spraying downtown this year?" The virus has resulted in alarming birth defects and is carried by the *Aedes aegypti* mosquito, which is also associated with dengue and yellow fever.

But it will come as no surprise that spraying for mosquitoes is not neutral for bees. According to the North Carolina State University Department of Entomology, "Problems may arise if these insecticides come into contact with honey bees. Honey bees are susceptible to many insecticides, and in fact pesticides are a major cause of honey bee deaths." Some compounds create fewer problems than others: NCSU says "Sumithrin (Anvil) is relatively safe." But there are lots of other things to know, such as what kind of application (aerial or ground), what formulation (dusts or sprays) and what time of day or temperature they are applied.

Though this town (with all the diplomatic, international development, ethnic, and even intelligence communities jetting all over the place) is absolutely going to be ground zero for serious mosquito abatement, it is likely that every city with a bug control budget will be upping the ante this year. What do you know about local plans? Who can you talk to about it? How will you protect your bees with the information you manage to get?

But wait! There's more! Government officials are not the only folks who are going to want to take action to protect vulnerable people: this is going to be a banner year for every pest control business in town, especially the ones that already advertise mosquito control, and if you have a pregnant neighbor, "Just say no" may not be persuasive advice. So it might help to have some information your fellow citizens can use as well, and a relationship with them that they value enough to do so.

If you want to read no further, here is the summary for the rest of this article:

- Know who in your local government is in charge of mosquito control, and what their plans are;
- Make sure that it's known that beekeepers are there (if possible *exactly* where);
- Give official folks facts on what practices will protect bees and other pollinators;
- Express your preferences for which kinds of control (chemical, delivery system, location) you prefer;
- Get more than one beekeeper or green ally to repeat the message (*lots* more);
- Find out when abatement is going to happen near you, and protect your bees as best you can;
- Tell your neighbors that their abatement efforts could kill your bees, and try to give them similar preference and application information;
- Ask neighbors to share info back (like when the pest guy is coming); and
- Tell them you care about their health as much as you are asking them to care about your bees.

You have probably figured out that I use communication as a primary tool in solving urban beekeeping problems. In this case, the communication takes place mostly between people, not via social

A Beekeeper's Mosquito Control "Asks"

- Tell me ahead of time: here's my contact info
- Tell them that my bees are here
- Indoor rather than outdoor spraying
- Time (pre-dawn, post-dusk) when bees are not flying
- Wait for weather that bees don't like: Low temps, high winds, rainy days
- Less toxic compounds (Want a list? Here's a good one from Clemson–Pgs.3/4: http://tinyurl.com/hgpn5la–google your state extension service, too!)
- Ultra-low volume application
- Ground applications rather than aerial
- Sprays rather than dusts
- Granules rather than sprays
- Water soluble sprays rather than emusifiable ones
- Fine sprays rather than coarse
- Avoid microencapsulated products (that can be collected like pollen)

Zika and the Urban Bee

media. Important stuff requires real connection. We talk with non-beekeepers about bees, we talk with other beekeepers about bee science and how to talk to the public, we talk with community organizations about how to include bees in the structure of our shared lives.

In the eyes of many, I am also a lackey: I want people to register their bees and keep them according to best management practices and the law (where the latter was not written by Alice in Wonderland, anyway). I want beekeepers to take primary responsibility for the health of their hives with an eye to the hive down the street as well, and to lose some sleep if they might be creating a nuisance condition for the non-beekeepers around them. Because of all this communication, now that we have a potential problem, I have ongoing conversations going with folks who might listen. And we need them to listen.

In this city, the beekeeping rules and registrations are managed by the same agency that oversees pesticide use and applicators. Right up front, our point of contact has told us that we could face fines for not registering colonies and creating a nuisance (which was not popular news), but if we are registered and our bees are harmed by an illegal application (off label, wrong time of day, etc.) the fines on applicators run into *orders of magnitude* more. And the agency is *very interested* in hearing about such bee kills. If they know where the bees are, and a public spraying is planned, they also have the opportunity to let beekeepers know and/or alter their plans with an awareness that we are there. As the former president of a nearby state association, I know that this sort of arrangement seemed like a lovely dream there. In the city, maybe more than almost anywhere else, this kind of collaboration is possible.

According to experts in countries that have had Zika for a long time, the whole spraying thing is a long-term losing proposition, anyway: it not only kills nearby beneficial insects, it fails to eradicate the target species as well: creating resistance. Joseph Conlon of the American Mosquito Control Association, has said "For that reason, people need to understand that chemical sprays are not the answer to *Aedes aegypti*." Some point out that indoor spraying may be helpful: it collects on walls and other surfaces where mosquitoes land, poisoning them and not beneficials in the environment at large, and Zika mosquitoes also tend to collect around human habitations. But remember, local officials are going to be asked to respond quickly to something that the World Health Organization has identified as a public health emergency, and what they have at hand is sprayers and chemicals they have purchased before. Short term, the best hope might be to get them to use the lesser of all the evils at the least damaging time of day. Going forward, you might start a conversation that could save bees and beneficials for years ahead.

Your neighbors, however, are not bound by these choices, and that can be either scary or hopeful. The website of a local squad that targets mosquitoes says something your neighbors may not know, however: "This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow to drift to blooming crops if bees are visiting the treatment area." (They also mention that it is acutely toxic to aquatic wildlife when it washes off.) If you live in downtown Washington DC, I can assure you that bees are visiting the treatment area. So you need to ask your neighbors for one of two things: to get this service to come when flowers are not blooming and bees are not flying, or to help you protect your bees from their application by letting you know what is happening, where and when. Frankly, I am not too hopeful that we can get through this unscathed.

I have loads of other criticisms of these services, like depositing pesticides on the tops of leaves misses the bottom, where the mosquitoes hang out, and since they fly, what's the use of spraying one yard? To cut to the chase, it would be better to encourage standing water management, mosquito dunks, and technologies that target biting insect behavior specifically through the release of CO2. Having a couple of dunks in your pocket to give away might be a nice gesture, too. My buddy Del sometimes goes around with his cordless drill, offering to poke holes in the bottom of garbage cans that collect rainwater. You get the idea.

What can you do when you know sprays are coming? If you can, move those hives away, if you can't, please close and/or cover them (some sources suggest burlap soaked in water: make sure you know where that burlap came from). If your bees have been using nearby water sources, empty them and refill after the treatment. If you are closing your bees in hot weather, try to provide internal water, and open up ventilation once any airborne chemicals are no longer present. If you do have a bee kill, report it locally, and then check the Pollinator Stewardship Council web page at www.pollinatorstewardship.org for their free Quick Guide to reporting a bee kill pdf. It is an invaluable listing of *every* state's lead pesticide agencies, plus the Apiary Inspectors. Bee Informed, EPA, and other agencies that need to, and want to know. Available is an emergency response kit if you experience a kill and contacts and instructions for an event.

So here is another reason to talk to your community about bees, especially your neighbors, and to build positive, collaborative networks in cities that look out for bees and each other. You don't get one without the other. If you have already been out there with outreach and the odd jar of honey, this might not be as hard as you think. If you have not, this is a really good reason to start. BC

Toni Burnham keeps her bees in Washington, DC and keeps up with what's going on in urban beekeeping.

Sherlock Holmes In The (Dead) Beehive

Ann **Harman**

It is a beautiful Spring day and time to open your hives to see what is needed. Uh oh! One colony is dead! You noticed that all the other hives had active flight except this one. You gave it a good thump on the side and did not hear an answering buzz. At this point you could just sit down and cry – but wouldn't it be better to find out why? Certainly! You could try to learn what happened so you might be able to prevent such a problem in the future.

Your first thought is to telephone your mentor from last year. Now the scene shifts – to the mentor. The telephone rings and the words of an unhappy beekeeper reach your ears. 'My bees died. Why?' It is that 'why' part that you, an experienced beekeeper, are supposed to solve. Furthermore you are supposed to solve it over the telephone.

No, this scene just won't work. Neither will a call to the CSI investigators. Yes, on TV CSI does have a fancy laboratory that seems to do impossible tests to solve difficult crimes. I don't think CSI would be helpful.

So let's step back in time to Sherlock Holmes and see if Sherlock Holmes can help. Holmes was always shouting 'Give me the FACTS!' So that is just what you are going to do. Find the facts and examine the facts that this dead colony presents.

With any crime scene the sooner the scene is scoured for evidence the easier the crime is to solve. No, your dead colony is not a crime scene but the sooner you can examine the hive and the dead bees the easier the reason is to determine. So let us begin on the hive 'necropsy.' By the way, on humans it is an autopsy. On animals (the bee is an animal) it is a necropsy. (Yes, I know, the hive itself isn't alive but you may be examining dead bees.)

Think back – and look at your records (you do keep some sort of records?) – when was the last time you saw that this colony was alive? No matter what climate you live in, you need to check at least once a month. In the warm areas of the U.S. bees can remain quite active 12 months of the year. In temperate and even in the very cold areas you do need to check on them once a month. Although there is not much you can do if a colony is dead in the cold Winter months, you can mark it to be examined as soon as possible.

In addition it is a good idea to block the hive entrance to prevent robbing. If the colony died from disease such as American foulbrood, robbing on a warmish day could spread that to other colonies. If it died from other reasons, you want to preserve the hive contents as best you can to examine later. Do not wrap it in a plastic trash bag. The colony and other hive contents will 'steam cook' on a sunny day and destroy evidence. Just block the entrance with a piece of window screen or the solid part of an entrance reducer or bricks.

It's time to check records again. Is this the colony that seemed weak back in early September? Is this the wimpy colony that you thought you could bring through the Winter if you just fed it plenty of syrup and gave it a nice pollen patty? Wimpy colonies in early Autumn are wimpy for a reason and food just might not be the reason. If the queen is not laying enough eggs to make a good Winter cluster, the colony will simply perish.

I hope that you have checked all around the hive itself to make certain it is intact, upright and looking quite normal. Colonies have survived bad Winter weather with tops blown off or storm-damaged tree limbs resting on top. All seems normal? Good. Now remove the top cover and examine the underside of it. If it is dry that is a good sign. If it is wet and appears to have been wet for a time, make sure the metal cover has no holes where rain or melting snow could enter. Bees can withstand dry cold, but they cannot cope with wet and cold. Since it is new equipment all is well. Set the top cover aside.

Now Sherlock will want to know if you provided top ventilation for the hive. Moisture produced by the bees eating honey rises in the hive and must escape. If the top cover was raised in front by a bee

What can a handful of dead bees tell you? Lots, it seems.

space, then the hive should be dry. If no ventilation was provided evidence of too much moisture may be seen during your examination. Moisture that rises with no escape will condense on the underside of the inner and outer covers. Then that moisture may freeze on a cold day only to melt on a warmer sunny day and literally rain down on the bees.

At this point Sherlock's good friend Watson is going to ask a question. Is there a hive top feeder or a pail feeder or an entrance feeder with syrup on the hive? In temperate and cold climates the bees cannot process syrup during Winter months since water must be removed from syrup. During the Winter in those climates the bees depend on honey or syrup they have stored in cells in comb above and to the sides of the cluster area. During warm Autumn days the bees would be able to evaporate water from syrup to be stored as 'honey' with low moisture content.

The next part of the hive to be removed and inspected is the inner cover. If it is dry, set it aside. Now what is next? It should be the top brood chamber. If it is, then you will be removing frames for examination. Suppose, however, you had thought about collecting some honey from your hive and the top box is really a honey super with a queen excluder underneath? At this point you may be close to the reason the colony died.

Since the queen cannot pass through the excluder the colony ate its way up into the honey super. The queen, left behind, died from neglect and cold. No replacement bees were born during January and February so the colony withered away. Next time be certain a queen excluder is not forgotten.

But you were lucky. The box under the inner cover is indeed the top brood chamber. You need to remove frames, one by one, to see if there are any dead bees and if there is stored honey. You find no bees and all frames full of capped honey or stored sugar syrup. So the colony went into the winter with good stores, enough to last until early nectar sources appear. Everything you examine is dry, not showing signs of moisture. And, so far, no bad smells.

If you find no disease in this hive the food stores in this box can be given to your other colonies to use. Scratching the cappings will encourage your other colonies to clean up the comb. However if you will be buying or making a nuc or buying a package this box can be used to provide a source of food for a good start. Remove this brood chamber and set it aside. You should cover it so robbing does not start. Remember – you still do not know if disease is present.

Now you will examine the next brood chamber. Your hive consisted of three medium depth boxes so you would not have to lift the heavier deep ones. Since the first box you examined was dry the colony does not exhibit moisture problems. The first two frames you remove, from one side, contain some honey. But the next one has a patch of empty cells. You are now beginning to enter an area that might have some clues. Before you go any further, do you see anything not normal? No. On to the next frame. Many empty cells and one dead bee hanging on by a leg. No bad smells. And no dead bees stuffed headfirst into empty cells.

If you had seen a patch of dead bees headfirst in cells one conclusion would have been that this colony died of starvation. The cluster simply could not move upward to the stores. If you are a good Weather Watcher you might remember a spell of unusually cold weather that came suddenly causing the cluster to remain in place. But the facts you found do not support this idea.

As you progress through the frames in this brood chamber, you might note that the empty cluster area seems small. This was not a wimpy colony back in Autumn. But as the colony moved up from the bottom brood chamber it could have occupied a larger area. Remember the cluster is shaped like a sphere even though it is formed with comb running through it. Sometimes it is hard to visualize that sphere as you are removing frames.

Since this brood chamber does not provide much information except lack of bees and no diseased brood area – in fact no capped brood – set this hive body aside but cover it also, just to be safe.

Now the bottom brood chamber will undergo the same frame-by-frame inspection. Each frame is empty of food stores and bees except for an occasional dead one that falls off as you handle the frame. You see no signs of disease, no bad smells. So you can use that hive body with stored honey and the frames with drawn comb.

Now you have arrived at the screen bottom board. It is a mess. You see tiny bits of wax the bees dropped while uncapping honey stores. There are some small clumps of dead bees here and there. Go ahead and poke around in them. WAIT! Is that a spot of bright color in that tangle of dead bees? Oh! It *is* the queen! Dead! Her year color dot gave her away. You were lucky that bees had not removed her before they died.

Now you have an answer: the queen died. The colony simply dwindled away with normal death and no eggs being laid to replace that normal death. She looks fine so what happened? Well, sometimes queens just do that, even if young.

At this point you may wonder if there was something you did? No. Was there something you could have done to save the situation? No. You have no idea exactly when she died and, being winter with cold weather, colonies are best left alone.

So what does Sherlock have to say?

Elementary my dear ~~Watson~~ beekeeper. BC

Ann Harman discovers the mysteries of the beehives from her home in Flint Hill, Virginia.

Bees & Cannabis

photo by Arne Hückelheim

Sharon **Schmidt**

Very little research appears in the literature about how honey bees interact with cannabis plants containing levels of THC appropriate for recreational or medical use. In fact, only one scholarly article about the interaction between cannabis plants and bees can be found. So what are the biologic and physiological relationships between cannabis and *Apis mellifera*?

When I became a beekeeper I located some of my bee hives on a property that has beautiful land resources. The property owners grow organic plants and flowers during the summer and have a clean and continuously running stream a few yards away from the hives. The hives are situated facing south-east and the area has a big thicket of tall, mature plants on the north side of the hives to protect against winter winds. Pigs in a neighboring field stir up and then loll around in puddles of muck during Spring and Summer and sometimes the bees seem attracted to the puddles. The community gardens, visible from the property interest the bees a great deal. The setting is idyllic and the bees proved to be good pollinators.

I had no warning that my bees would eventually be in the middle of a cannabis grow. However on the day that Oregon law changed to allow citizens to grow cannabis, an odor that some described as "heavenly" and others referred to as "skunk-like" emanated from the fields.

When I told people that my bees now had access to cannabis, the reaction was always the same; they asked whether the bees were "buzzed" (intoxicated) and whether their honey would make people "high" (also intoxicated). I was fascinated by this question! Would we (quite unintentionally) produce psychoactive honey? This began a line of inquiry on my part to determine whether bees are interested in cannabis, what they might glean from it nutritionally and the effects of cannabis on bees and bee products.

I had an opportunity to check on the hives on at least a weekly basis and hoped to make some observation of what the bees might be harvesting. I was disappointed though. Observation of the bees revealed that there was apparently no interaction in spite of the abundance of plants and close proximity of cannabis plants to the hives.

Why not? One hypothesis was that the bees were not attracted to the aroma of cannabis plants. Bees have an exquisite olfactory sense that they use to detect pheromones of other bees and to find nectar. They are also attracted to colors and these two appeals to the senses are like neon billboards for finding food and mating opportunities. Cannabis does not have these attributes.

Thus, there are reasons that bees would not find cannabis attractive. There is also an absence of specific information suggesting attractiveness of cannabis (to bees) in the literature. However an apparently contradictory piece of video footage turned up on social media. The video showed seemingly excited honey bees buzzing around and alighting upon a cannabis plant from which they appeared to be feeding (Nicolas Trainerbees, 2015).

Many viewers seeing that footage probably believe that the bees derived some chemical excitement from their contact with the plant. However this is very unlikely because bees have no neuroreceptors that would allow them to apprehend the psychoactive elements present in cannabis.

In their 2001 article, "Cannabinoid receptors are absent in insects" (Mcpartland, J, DiMarzo, V, De Petrocellis, L, Mercer, A, Glass, M), the authors revealed that insects do not produce arachidonic acid which is a precursor of necessary ligands. It is thought that the CB (cannabinoid) receptor was lost in insects over the course of evolution. The authors also noted that the CB receptor appears to be the only known neuroreceptor that is present in mammals and absent in insects. Because of its documented absence, we can reliably say that bees are unable to experience cannabis in the same way humans do.

The next often asked question fielded by this writer is whether honey made by bees having access to cannabis plants contains THC and whether it exerts a psychoactive effect on those consuming it.

The cannabis plant is mostly wind pollinated and therefore has not evolved to attract bees. It does not produce a smell that would attract bees, nor is it colorful and finally, and most importantly, it is unable to provide a reward in the form of floral nectar. As those familiar with *Apis mellifera* know, it is nectar and not pollen that is required by bees to make honey. But the male plant does provide pollen in some circumstances.

The existing scholarly article on the topic (Dalio, J.S., 2012) notes that cannabis pollen seems to be a food of last resort for bees. The author notes that bees (in India where the observations occurred) turned to cannabis plants as a source of protein but only visited male plants during times of dehiscence when the male plant's reproductive organs released pollen and that bees were only interested in that pollen during a pollen dearth.

So how can we account for

the reports of persons who say they have seen bees congregating and apparently foraging on female plants or of the images available on the social media site? Seeking answers, this writer approached Norman Carreck (Science Director and Senior Director of Journal of the Apiculture Research) who suggested that the possible source of the female plant's attractiveness to bees could be "extra floral nectaries" documented as an attribute of the cannabis plant by John Free (1970) in his book, Insect Pollination of Crops (personal communication with Mr. Carreck, January 20, 2016). Extra floral nectaries include glands residing outside the calyx producing both water and sugars. There are no formal reports of extra floral nectaries in cannabis plants other than the one previously referenced by John Free (1970). However if cannabis plants are shown to have these, they could serve a defensive purpose by attracting ants which then serve as guards protecting the plant from herbivores – or they might serve to attract bees. However, cannabis is known to have glandular trichomes (plant hairs that secrete fluid), which could also be a plant feature interesting to bees (personal communication with Dr. Marjorie Weber, Postdoctoral Fellow,

Center for Population Biology, UC Davis, January 21, 2016).

In cannabis plants, bulbous type trichomes are the smallest at 15-30 microns and are barely visible. Capitate-sessile trichomes measure from 25-100 microns across and capitate-stalked trichomes measure from 150-500 microns and are the most abundant. The latter contain the majority of the psychoactive cannabinoids (THC, THCV, CBN) and the effects of use are at least partly mediated by how much degradation is allowed prior to harvest. It appears that trichomes have evolved for the purpose of making a plant less tasty to animals and insects (Anonymous, 2016) making the idea that bees are feeding from trichomes less plausible and more likely that they might be collecting resin from them.

In another discussion with noted entomologist, Dr. Dewey Caron, more ideas were advanced. First, that another naturally occurring source of interest for bees called "honeydew" is often the object of their interest. Honeydew is simply the waste product of scale or other sucking insects which cannabis is likely to host. These tiny insects probably concentrate their feeding (and excretion) at the tender surfaces of new plant growth and produce tasty waste products that bees might feed on. Second, is the possibility that bees might be collecting resins for purposes of making propolis (a sticky bee product used by them to sanitize, reinforce and weatherproof the hive) and third, that bees demonstrating activity on cannabis plants might even be seeking moisture from irrigation (personal communication with Dr. Caron January 21, 2016).

Bulbous Trichomes.

Presently, it seems that some aspects of the relationship between bees and cannabis are not yet verified. Judging from statements occurring in public discourse, misinformation about bees, cannabis and honey based upon legend and lore exists among some of the public.

Much may yet be discovered, but some hypotheses are more likely true than others: First, it appears that bees cannot experience altered neurophysiology as a result of exposure to cannabis given that they have no neuroreceptors for the chemical it contains. Second, the literature suggests that they do not prefer cannabis pollen but will resort to visiting male plants and collecting pollen from them mostly during a floral dearth. Third, if bees congregate and appear to be feeding upon female plants it is not to collect floral nectar because cannabis does not produce flowers containing nectar; there is no known reason for the plant to produce nectar to attract pollinators due to the fact that it has evolved as a wind pollinated plant. However the plant may produce water and sugars if extra floral nectaries are proved to be present in this plant which could account for observations and anecdotes about bees congregating there.

Fourth, it is possible that an extra floral plant exudate might be used by *Apis mellifera* to make honey and one can speculate about the presence of the precursors of psychoactive chemicals. It seems unlikely though unless the bees are actually foraging on trichomes. Trichomes have evolved to protect the plant from the predatory interests of animals and insects so the idea of bees foraging from them seems unlikely. The common use of the term "sugar" to describe the frosty looking trichomes which have become opaque may further cloud the issue, bringing some to equate trichomes with sweetness. In fact, people who advocate juicing cannabis reference the need to mix it with other vegetable juice to cut the bitter taste. Generally bees do not seem to seek out bitter fluids.

Fifth, even if the resulting honey did contain such alkaloids, bee products would not be psychoactive without heat being applied for the purpose of converting alkaloids from an inactive to an active state (decarboxylation). Thus persons reporting a high after eating raw honey made by bees having access to cannabis are much more likely to be reporting a psychological phenomenon rather than a

physiological one.

Finally, bees have an affinity for honeydew (waste products of scale and other insects that inhabit and forage in cannabis plants) therefore any interest bees demonstrate toward this plant could be based on the presence of honeydew, or even due to bees' interest in collecting moisture or resin.

A final possibility is that bees might be trained to collect whatever substances are available from the plant as a result of experiencing a conditioning paradigm. Under such circumstances they might learn to associate the plant odor with a reward (sugar water) which could account for the enthusiasm they appear to be showing in the referenced video.

Future observation will likely yield more information about cannabis and about how *Apis mellifera* interacts with this plant.

Insofar as is known, no one has examined the composition of contents of the gut of bees appearing to forage on cannabis or even the composition of their propolis. No micro observation of their interaction with the plant is readily available either. Given the novelty of legal cannabis farming in some of the American states it seems likely that there will finally be more interest and opportunity for systematic observation and research allowing anecdotal reports and scientific data to be accurately reconciled. BC

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CALENDAR

♦INTERNATIONAL♦

The 6th Cuban Congress will be held in Havanna July 17-22.

Learn about their technology, productive handling, pollination, bee selection and breeding.

For more information visit www.cubabeekeeping.com/home.html. Transeair Travel has arranged a congress Travel Package. For trip information call them at 202.362.6100 or blubic@transeairtavel.com.

♦CONNECTICUT♦

CT Beekeepers Association will hold their meeting April 16 at the CT Ag Experiment Station, Jones Auditorium, New Haven beginning at 9:00 a.m.

Speakers will be Betty Mencucci and Carl Jurica. Bring a dish to share at the potluck lunch.

For information contact Steve Dinsmore, 860.949.5924.

Back Yard Beekeepers Association 2016 Speaker Schedule – April 26: Roberta Gantz, NYS TBD; May 24: James Wilkes, Hive Tracks – using technology for record keeping; June 28: Dinner & Silent Auction Meeting; September 27: Brenna Traver, Penn State, Honey Bee Pathogens; October 27: Anne Frey, TBD; November 17: Jennifer Tsuruda, Clemson TBD.

Each month we have timely weekend hands on inspection workshops, bee school, mentor program and more. For dates and locations and more information please visit **www.backyardbeekeepers.com**.

♦GEORGIA♦

Two-Day Queen Rearing Course taught by Jennifer Berry at her farm in Comer Georgia, June 3-4 and again Jun3 10-11. No experience necessary.

For more information visit **www.honeypondfarm.com**.

♦ILLINOIS♦

Univ of IL Bees and Beekeeping Short Course April 16 at the Bee Research Facility and Carl R. Woese Institute for Genomic Biology.

The cost is $100. Please bring a veil. The course is limited to 50 participants.

For more information and to register email **lcundiff@illinois.edu** or 217.265.7614.

♦MISSOURI♦

Will County Beekeepers will present an all-day conference – Bee Prepared. Healthy Bees Make Happy Beekeepers – for the beginner and the expert. April 2 at Joliet Junior College, Weitendorf Ag Ed Center, 17840 W. Laraway Road, Joliet.

For information visit **http://willbees.org/beeprepared.**

♦MONTANA♦

Master Beekeeping Certificate endorsed by MT State Beekeepers Association; The American Honey Producers Association and Project Apis m.

For more information visit **www.UMT.EDU/BEE**.

♦NEW YORK♦

The Champlain Valley Beekeepers Association will hold its annual meeting April 30 at the Beekmantown Town Hall. Bring your lunch.

Guest speaker will be Medhat Nasr. The cost is $20.

For information contact Dick Crawford 518.561.7167.

♦OHIO♦

Medina County Beekeepers Association meets the third Monday of the month at the Root Candle Company in Medina, OH. The meeting starts at 7:00 p.m.

For information visit **www.medinabeekeepers.com**.

♦OKLAHOMA♦

NEOBA Bee Buzz will be held April 1-2 at East Side Christian Church, 1438 S. Indianapolis Ave., Tulsa.

The fee is $35 and includes dinner Friday and lunch on Saturday.

Register online at **www.neoba.org**.

♦PENNSYLVANIA♦

The Capital Area Beekeepers' Association will hold their Annual Short Course, May 7 & 14 at the Dauphin County Ag & Natural Resources Center.

The cost is $50.

For additional information visit **cabapa.org** or contact 717.365.3215 or **jdnovinger@epix.net**.

Queen Rearing Course at DE Valley College, Main Campus, May 7-8 and 17.

The fee is $199. Bring your veil and a three-ring binder. Gloves are not allowed in the beeyard.

For information and to register visit **http://vincemasterbeekeeper.com/courses/.**

♦TEXAS♦

The Central TX Beekeepers will host a Beginners School April 16 at the Washington County Fairgrounds in Brenham.

For more information contact Michael Kelling, **centraltexasbeekeepers@gmail.com** or 979.277.0411.

♦VIRGINIA♦

March 5 : Floyd, VA - Getting Started: First Steps in Beekeeping - This workshop will offer practical advice for those who want to have bees and for those who had bees and want to start again. With Gunther Hauk & Alex Tuchman. 540-745-2153 – **www.spikenardfarm.org**

April 29 & 30 – Floyd, VA - Principles and Methods of Biodynamic Beekeeping - An in-depth introduction to biodynamic/sustainable beekeeping practices. With Gunther Hauk & Alex Tuchman. 540-745-2153 – **www.spikenardfarm.org**

May 6 & 7 – Floyd, VA – Big Pollinator Plant Sale - Sanctuary Tours, Live Music, Special Snacks, Presentation/Lecture: "The Plight of the Honeybee & the Female Paradigm" 540-745-2153 – www.spikenardfarm.org

♦WEST VIRGINIA♦

Corridor G Beekeepers Association will host the WV Beekeepers state Spring meeting April 9 at Chapmanville Middle School, 300 Vance Street, Chapmanville.

Featured speaker is Michael Bush. The cost is $30 including lunch before March 18.

To register contact Kathy Watson, **kathymullarkywatson@gmail.com**, 304.855.8504.

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If you are having an annual meeting or teaching a beginning beekeeping class, we are happy to send you magazines to give to your attendees and students. BUT – we need to receive your request four weeks before your event so that we have time to process your request. Please email Amanda at Amanda@BeeCulture.com with the number of magazines needed, a complete mailing address and a contact person.

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Mizzbehavin, New Beeginnings, and Beelive: Bees In Prison

Nancy **Hill**

Crystal's voice softens as she takes you back to the cold, rainy April night she and nine other women incarcerated at Oregon's Coffee Creek Correctional Facility met the honey bees. "We didn't know what to expect," she says, her waist-length braid just visible when she tips her head to the side. Her deep brown eyes seem to be looking beyond the small table she sits at in the cramped office space at Coffee Creek's minimum security facility.

Folding her hands on the metal tabletop, she shifts in her chair. "We were interviewed for the program the day before the bees came. Before we had time to ask questions, ten of us were waiting in a room almost always off limits to us. We'd been outcounted. Everything about the night was unusual."

Outcounting is a term for the circumstance that occurs when an inmate doesn't have to be in her bunk waiting for a head count, which happens five times a day. Crystal had been going through this regiment for nearly 15 years, and although she was as used to it as she was to the razor-wire fences surrounding the grounds in which she lived, the frequent counting was a reminder of her total lack of freedom.

Crystal had doggedly participated in every program offered, but the other programs had been well established and she knew what to expect. The beekeeping program was different. She would be one of the first participants.

"I felt like a child about to enter a candy shop," she recalls. "I had no idea what I would find, but I knew it would be amazing. A bee program in prison? That just didn't happen."

And yet 10 women were about to learn everything they needed to know to become beekeeping apprentices by the end of the year.

While the program was a mystery unfolding to the participants, prison officials had been working on it for months. Captain Chad Naugle, head of the sustainability program for Oregon's prisons, worked tirelessly behind the scenes to bring the idea to fruition. "The program appealed to me because it had both a nature and a sustainability aspect to it. It also would provide offenders with a skill that could help them earn a living when they were released." Moreover, it would augment the dwindling bee population while spreading an awareness of the seriousness of that threat to the environment.

Captain Naugle began meeting with prison officials, including Captain Marsha McCorkhill who has been a central figure throughout the program, and the beekeeping community who would work with inmates. Within a few months, a plan was in place to hold the program at one of Oregon's men's prison, but complications arose that prevented that.

Determined not to let this opportunity go, Captain Naugle met with Coffee Creek staff. They loved the idea. "Coffee Creek was an ideal place," he says. "It went hand in hand with the garden and viola program several groups at Coffee Creek were already involved with." In this program, women grow violas, which are on the endangered plant list, for the silverspot butterfly, which is on Oregon's endangered species list. The beekeeping program was a natural fit with this and other habitat conservation programs in Oregon corrections.

Captain Naugle found internal funding sources, some beekeeping organizations donated supplies, and things flew into place. He advertised the program inviting women in the minimum security to submit an application to participate.

Crystal jumped at the opportunity. "When I first saw the flyer about a bee program, I thought it was a joke," she recalls. "But I'm always open to new things, and I had learned at Coffee Creek that any kind of education leads to freedom, so I sent a kyte to see if I could participate." Her kyte – a Coffee Creek term for a letter—was one of 10 the prison received.

The day after the application process closed, all applicants were interviewed. Everyone was accepted. While each woman was eager to participate, their reasons for applying were as varied as the roles of bees in a hive. One wanted to face her fear of bees. One had always loved bees and wanted to learn more about them. One had family members who had worked with bees.

Finally, it was time to don the beekeeping suits. Crystal remembers this fondly. "We nearly jumped into them we were so excited. One of the staff told us we looked like giant marshmallows."

Suited up, the women crowded into a van to take them to the hives. "It seemed to take forever to get to the bees

even though it was probably a 30-second drive," Crystal says with a laugh. "But we were out of our unit and headed into unknown territory. Anticipation filled the van. Through the rain I could make out huge, beautiful trees and wide open spaces. We wouldn't be behind a fence."

The women found a gathering of people waiting for them. Crystal's eyes tear as she remembers how it felt to have so many people there to meet them. Among those greeting them were high-ranking prison officials; a retired assistant superintendent and his wife; beekeepers Bunny Cramer-Carter and Bruce Roller; and Captains McCorkhill and Naugle.

"All of us were stunned that so many people had come out on this freezing night to meet us. I remember Bruce shaking everybody's hand. When you're treated like that in this environment, it's very empowering."

When Bruce Roller heard about the Coffee Creek program, he wanted to give back. He had been a beekeeper since 2009. He started his first hive when he heard about problems with the bee population. "The only thing I could do to help was to put more bees into the world."

While Bunny Cramer-Carter and Ann Murray would teach the participants in the classroom, Bruce would work alongside the women with the hives. His first job? Teach the women about adding a queen to a hive.

"As soon as we got there, we saw three hives," Crystal says, "but we couldn't see any bees. We had to put our veils on first. They were the old-fashion kind that you had to tuck all around your chin and cinch it and then tie it around your body. Finally we got that done and then put on our gloves."

The time to take out the queen had come. The women gathered under an awning, which was necessary to keep the bees from getting wet.

"None of us said a word while Bruce explained he would put a marshmallow in her cage, pull out the plug, and replace it with a marshmallow. By the time she ate through it, the other bees in the hive would be used to her scent," Crystal explains.

The women watched enthralled. But what came next was even more fascinating. "The bees were in a cage flying around. We had to hit the cage a little and then shake them into the box," Crystal says.

Her eyes shine at the memory, and she lowers her voice. "Except for the rain, it was completely quiet. Then we heard the buzzing. It was so calming and peaceful, like nothing you've heard before. All we hear in here are doors slamming and keys jangling and locks closing. The sound of bees buzzing was soothing to our souls."

Bruce says that when he saw the women's enthusiasm, he had little doubt the program would be fruitful for everyone involved. He was never disappointed. From the first night, the women were fully engaged, although some were initially a bit nervous. Soon, though, their fascination with the bees was evident. Bruce states that every time the women came to work with the bees, they had more questions and studied the hives for any changes that could mean problems. They learned the rolls each bee played and could quickly identify them. Some even learned to pet the bees.

"One of the things that always makes the women smile is watching a bee work its way out of a cell. Seeing a bee born amazes them," Bruce reports.

Classroom learning, a key component of the program, wasn't nearly as exciting at first. As Bunny, who co-teaches with beekeeper Ann Murray, recalls, "The women seemed a little bored, but when they were able to work with hives, they got seriously interested. In class they began challenging what they were learning. They wanted to know what any unusual activity they'd seen in their hives meant."

The group had three hives. Initially, the hives were unadorned, nameless white boxes, but the women soon painted them in colorful designs and named the hives New Beeginnings, Beelieve, and Mizzbeehavin.

Bunny Cramer-Carter reports she has witnessed changes not only in the women themselves but also in their relationships with their families. "It brings family together. Most of the women talk to their families about the bees, and families participate by sending books. Some have families who'll give them space for hives when they get out."

She enjoys working with the women. "Some people are against helping the women because they have judged them, but if they spent time with them, I think they'd change their minds."

Co-teacher Ann Murray is an artist. She has a minor in criminal justice, and while she taught art in a juvenile correctional facility, she'd never worked with incarcerated adults.

"Programs like this lower the recidivism rate," she says. "Again and again I see women learning life lessons from the bees. They see the bees communicate and know how important that is to keep the hive healthy. They see that working together is critical to survival." Ann says they learn what it takes to build a community, and they see altruism in action. "This will stay with them the rest of their lives."

Like Bunny, Ann thoroughly enjoys working with the women in Coffee Creek. "Being a part of this program makes my day. When I come back from class, I feel good for me but also for the bees because some of the women will go on working with them. They say this is the best thing they've ever done, and I believe them. We're there to bring sunshine into their lives, and then they bring it into ours."

Toward the end of the year-long class, the participants create a business plan. Bunny explains that she and Ann give the beekeepers-in-training a hypothetical amount

of money and catalogs to help them create their plans, which range from having a single hive to setting up and running a complex commercial business.

Everyone in the program passed their apprenticeship class at the end of the year. Eight of the women who participated in the first program have been released. Crystal is now participating in the second program and plans to have a bee business when she is released in June.

"One of the reasons I love the bees so much is because they survive. They depend on each other, and that's something I'm developing in my life. I'm learning I can turn to others for help. Coming from my background, I didn't have that before. I was alone, and you can't survive that way. You think you can, but you can't."

Crystal has been part of two different groups of women learning beekeeping. She stresses that her love for the bees and the lessons she has learned from them is something everyone in the program shares. "We learn together, we grow together, and everything I have said here about the bees and what they mean, is true for every one of us. They change our lives. They give us way, way more than honey."

From the time the program was first proposed, Coffee Creek staff knew the lessons the participants would absorb would extend far beyond the care of bees. They would learn about the environment and sustainability and acquire new skills they could use when they were released from prison. There were other intangibles that were difficult to predict.

Captain McCorkhill, who oversees the minimum security facility, sees tremendous value in the program. "The biggest difference is seeing women stopping and talking to each other about it. They know the bees' favorite color is purple. They educate each other. This is about being pro-social instead of criminal.

"They have more confidence. Maybe they've been told they were incompetent, failures. Some were scared, but they've overcome their fears. Women come here because of wrong choices and bad decisions, so I'm looking for healthy things they can carry on when they're back in the community. Maybe this program will give them a business or a hobby they can go to instead of committing a crime."

Captain McCorkhill went through the program herself, learning along with the women. She, too, took and passed the apprenticeship test. "When they see me out there they call me the bee lady. They always have a lot of questions, so it breaks the barrier down. They're not looking at the uniform, they're looking at me as a person."

The program also gives the women a new way to interact with staff, who are curious about the bees themselves. Instead of watching the women for rule infractions, the staff stops to talk to them about the bees.

The women in the current program express the same enthusiasm as Crystal. Christina had grandparents who kept bees. "I like the people in the beekeeping environment. The program gives us some self-worth. Some people come from crazy backgrounds. They do something good here, and they see that they can do good things. Knowledge is power, and nobody can take this away from us. The program makes us feel normal in such a panicky environment."

A participant who is also named Crystal reports that working with the bees has helped her with her child. "This is something I can pass on to her. I love the fact that it's women power in the hive. The girl bees take on all sorts of roles."

Isabelle, who had no interest in bees before the program, now plans to have four to eight hives when she gets out. "This program awakened a sense of personal responsibility – what I eat, how I interact with the earth. One thing about working with bees is seeing how the population is decreasing and how humans impact that and what we can do to help."

Sara was stung by hornets when she was six and so feared bees. She's overcome that now. She focuses a great deal on the health-related aspects of bees. "My goal is to learn about bees and organic gardening so when I get out, I can advocate for healthy living." She also likes that her 13-year-old daughter actually acknowledged that she knows something. "She listened to me talk about the bees and then said, 'You actually know what you're talking about.'" She laughs, then adds, "When I get out, this is something we'll do together."

The program is now in its second year. A second program has been set up in another Oregon correctional facility, and as word of the program's success buzzes around, others have also expressed interest in creating a similar program.

"The bees teach us about community," Crystal says. "We need to help each other, to work together. And that's one of the things we're all learning to do." BC

Installing Packages

~Kim Flottum

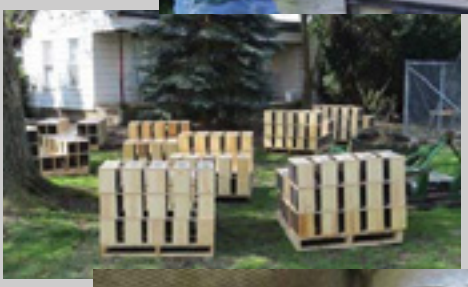
Bees are collected, either by shaking frames in to a funnel that fills the package, or by bouncing a whole super over a collection box. A queen excluder on top keeps the queen in the super. Then bees in the box are then poured into a package.

Packages removed from the field and assembled in the warehouse, where a feeder can and a queen are added, and the opening covered to keep them all in.

Packages are shipped in specialized trailers with climate control.

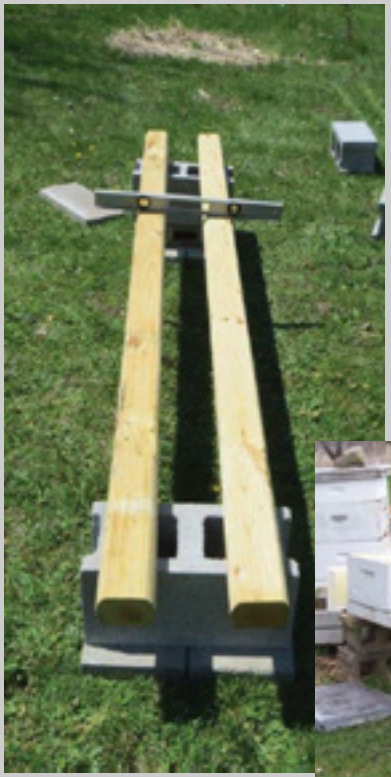
Packages of honey bees come from, basically, two areas of the US., the southeast, mainly southern Georgia and northern Florida, and from the west, mainly central and northern California. There are differences in the queens you get from these places because of where they are raised and how they are produced. To make a package, in the SE, producers search for the queen in the production colonies and once found, isolate her, then shake about a third of the worker bees in that colony into a collection container to be doled out and weighed and put into a 3 pound package. West coast package producers simply sift a super or two of bees from a colony into a container that has a queen excluder on top, so only workers go into the collection container. Workers are poured into the package, a can of sugar syrup is added along with a queen raised specifically for this purpose and the entrance sealed. The package is then shipped in special trailers, with air conditioning and humidity controls to a local supplier who then distributes them to you.

Pick up the bees. Most of us have a car. Put cardboard or several layers of newspaper on the back seat to place the package on. When you arrive expect a crowd of anxious beekeepers – just like you. Make sure you get the kind of bees you ordered – Italian, Carniolan, Russian, Buckfast – and that the queen is marked. Your queen may arrive marked, or she may get marked there. The bees should be hanging around the queen and feeder can, and there should be only a very few dead bees on the bottom of the cage. If more than 20 the package may be old bees, starving, overheated or subjected to something not to their liking. Check with the supplier if there are lots of dead bees. Bring a mister with sugar syrup in it and before you put the package in the car, feed the bees. This will settle them down a bit and give them something to do while on the trip home. This is why you need the newspaper. Don't let the car overheat. Tend toward air conditioning to keep the bees cool.



Often a local supplier will drive to a regional drop off and pick up only a few packages at a time, spreading out the delivery dates. Once they arrive they sit in the shade or a warehouse, are sprayed with water to keep them cool (a package will get very, very warm, and if not cooled will overheat and die), and sprayed with sugar syrup for feed. Make sure your queen is marked. Check before you leave.

Your supplier will tell you when the packages are to arrive so you can be prepared the day they come in. Have your hive stand ready, make sure you have plenty of sugar syrup ready for feeding and your boxes, frames, bottoms and covers are ready. If new, paint the boxes. The day the packages arrive, before you go to pick them up, get all your equipment out to the beeyard. Smoker and fuel, the box and frames the bees will go in along with the bottom board, inner cover and cover, hive tools, spray mister full of 1:1 sugar syrup, extra boxes to house the feeders on top of the box you will put the bees in, rubber bands to hold the queen cage on a frame if there's no way to hang it from the top bar, a flat head screwdriver for removing the feeder can if it's stuck in the opening of the package. If the weather doesn't cooperate when you get back home, put your package in a cool, dark place until you can get it introduced. A garage or basement is common. Feed, feed, feed the bees. Assume the feeder can is empty and they have no food. Generously spray both sides of the package with your mister 3 or 4 times a day to the point the bees are wet. This many bees will easily consume a quart of syrup in 24 hours, so don't get cheap now. They will starve if indeed the can is empty and you don't feed. Introduce as soon as possible when the weather clears.



Getting ready. Make sure your hive stand is strong, gather all your tools and be ready. Have feeder pails and mister filled with 1:1 sugar syrup.

When ready, assemble everything in the bee yard. To begin, thump the package to settle the bees on the bottom. Remove the cover and the queen and keep her warm. Remove 4 or 5 frames from you super. Thump again, remove can and cover and dump the bees in the super. Replace the frames, put the pail over the inner cover hole, put a super on to protect the feeder, close and done. If installing in a top bar hive, put a feeder (here a Boardman feeder works well) in one end without bars, put bars in about 2/3 of the hive, dump the bees where the opening is, replace bars and close.

When the time is right, install your package. Ideally, this is toward evening on a warm, friendly day, but we don't always have that luxury. Sooner rather than later, within reason is the rule. Make sure all your equipment is in the beeyard. Put on your beesuit. You probably won't need your smoker, but light it anyway, just for the practice and have it ready. Make sure your feeder pail and your mister are full of 1:1 sugar syrup. Inspect the package again to make sure the bees are doing well. Mist them to settle them down. Place the package on a firm surface and remove the cover over the feeder can if there is one. If the queen cage is right there remove it, blow off any clinging bees and put her in your pocket for protection. If she's inside the cage, carefully thump the cage to knock the bees off the can and onto the floor. Pry the feeder can out, remove the queen and replace the cover. Remove 3 or 4 frames from your prepared box and hang the queen cage, using the metal hook or hanger attached to the cage. If there isn't one, or it doesn't work, use the rubber band to hold the cage near the top and end of the frame. Don't put her in the middle because if the feed can leaks she will drown. Have the inner cover handy. Mist the bees. Knock them down again, give them a minute to settle a bit, then remove the feeder can completely. Cover the opening, take a breath, and begin slowly dumping the bees into the opening in the box. Shake it a little, tip it back and forth a few times and get most of them out. Then put the package in front of the hive and let the remaining bees find home. Carefully replace the frames, letting their own weight push the bees out of the way. When done, put on the inner cover, the feed pail over the hole, the extra box to protect the pail, and finally the cover. It's done. Give them a day or so to settle in, make sure the feed pail stays full and that the queen gets released in a week or so. You're a beekeeper!

~Kim Flottum

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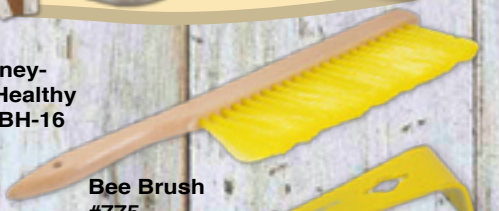

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