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Features . . . . . The Rest

Cover photo – honey frame with bees.
photo by Rob Keller of Napa California.

BIP Survey

Don't be misled by the lowball figures from the Bee Informed Partnership/USDA colony loss survey, suggesting that there has been some marginal improvement in losses. For many beekeeping operations, particularly commercial operations that rely on pollination in the almonds, the stronger colonies are split in the Spring and early Summer to regain their numbers. The strongest colonies may be split three or four ways, some are split more than once, but many of the splits don't make it either, so while a beekeeper may start with 100 colonies and end with 80 (or some multiple of that), which would suggest a 20% loss, the actual losses through the course of a year, the turnover, may be 50, 60, 70% or more for many of these operations. Queen failures and supercedures are rampant, BIP/USDA conveniently disregard these losses.

When a beekeeper's stronger colonies are split heavily it means that they will produce a much smaller honey crop or perhaps none at all. Look at the most recent figures for the U.S. honey crop, one of the lowest ever.

For hobbyist beekeepers with one or two colonies, splitting may not be an option and they rely on getting a package or two in the Spring. The package industry faces the same problems as everyone else, and their ability to supply a growing demand for packages in response to increasing losses is uncertain.

If we don't put a stop to the massive poisoning of the environment from neonicotinoids and a host of other chemicals the future is not promising.

Witness the nearly half million colonies damaged in California this spring from a tank mix of fungicides and an insect growth regulator.

Closer to home, just last week (5/14/14) in the Niwot area multiple colonies belonging to several beekeepers were damaged from spraying of one of these insect growth regulators (indoxacarb) on alfalfa, with abundant dandelions and mustard in bloom, in the middle of the day, despite the fact that this product carries the standard Bee Hazard Warning. The label, which the EPA claims is the way to mitigate the dangers of these chemicals, was simply ignored, and this is routine all across the country.

The other side of label language is enforcement, but this is another ruse. In August of 2013 illegal spraying on citrus groves caused an estimated $390,000 dollars in damages to area beekeepers but resulted in only a $1500 fine. In Oregon where 50,000 bumblebees were killed last year, a fine of $2900 was levied. The explanation from regulators was that this was the maximum they could levy "per incident", but with a little regualtory courage each tree should have been considered "an incident". $2900 times 65 trees would have gotten some attention. The Colorado Department of Agriculture has taken samples from the indoxacarb bee kill and is investigating, but will anything come of it? The last incident where a formal complaint was filed here in Boulder County was when an aerial applicator oversprayed blooming alfalfa with bifenthrin at a rate *several hundred times* the LD50. That resulted in a fine of $400 with no admission of guilt, while the beekeepers sustained thousands of dollars in damages. There was no compensation for the beekeepers effected, we are just expected to take it. I asked a rancher recently if he would mind if I came out and did a little target practice on his cattle, not kill them outright necessarily, just wing them, so they might drop their calves, fail to thrive, die over the Winter. Of course you know the answer to that question, but this is what beekeepers are expected to accept, time after time. It's just bees afterall, what's the big deal?

Tom Theobald
Niwot, CO

New AFB Treatment

I was pleased to see "A Better Way To Treat AFB" in your May issue. Ms. Yost presented information on AFB and the UNLV work in a clear and concise manner. Just thought you might like an update on the heavily AFB infested hive of mine that was treated with the phages: As of today (May 13), the hive is doing just fine, a nice brood pattern and no visible (or odoriferous) sign of AFB. Got to love those phages – and the hard work being done in this area by the UNLV researchers.

Karen Bean
Maple Falls, WA

Bee-Go And UV

It goes without saying, but sometimes we need a word of caution to remind us: Store all chemicals in a safe place, preferably one that is dark and cool. Bee-Go for all its usefulness in commercial bee operations is probably not going to be my product of choice any longer. Bee-Go is a corrosive liquid that causes burns. I had about ½ bottle(plastic) that I had set under a cherry tree last year and forgot about. The weeds grew up around it. I was cleaning up around the tree today, weeding and preparing to apply some pine straw mulch. I found the bottle and picked it up. The lid had split from the UV rays. I noticed a discarded water-bottle lying nearby, so I decided to use the lid on the Bee-Go. As soon as I applied pressure to the bottle while screwing on the lid, the bottle shattered, a result of UV deterioration. The liquid went on my face, arms and legs. Thankfully my eyeglasses saved my eyes. I immediately flushed my face, jeans and arms with cold water for about five minutes until I could remove my clothing. I got out of my clothes outside and proceeded to spend 15 minutes in a cool shower.

I had only some minor skin irritation and the lingering odor of Bee-go that no amount of scented shower soap could remove.

I am not faulting Bee-Go. I have used it many years with no problems. I haven't used it for honey harvesting in several years and only keep it on hand to assist occasionally in bee removals. I have been using only smoke and

a bee blower to remove bees from honey supers. I have decided to start using bee escapes and my brush and blower. I am old enough to know better, but that doesn't make me immune to accidents. From now on, I will try to minimize that possibility. Perhaps someone will use my experience as a heads-up. We sometimes forget about the damage of UV to plastics such as bottle and queen excluders, not to mention the dangers of UV to our skin as we work outside.

Bob Gaddis
Grifton, NC

Mentoring

I read your latest writings on mentoring in *Bee Culture* under the Inner Cover title with much interest. It is a much needed subject that needs more attention from beekeepers young and old, new and experienced, and those who are just now considering becoming a beekeeper.

As a long time beekeeper and mentor to hundreds of beekeepers, it is painfully clear to me that we need more qualified mentors to help keep beekeepers on track and our bees thriving. And as you point out so well, mentoring can be very intimidating to some. Usually the ones who worry about making mistakes are the best mentors I know because they care about the bees and they care about the beekeepers they are trying to help.

My mentor told me many years ago that if I did everything perfect I would not be human as we all make mistakes along the way. The good news is that the bees are very forgiving if we don't make the same mistakes over and over again. Making mistakes is a valuable part of learning if we pay attention to the end results of what we do and take corrective actions.

I know of beekeepers who lose their hives every year and keep buying bees. These folks need a good mentor for the sake of the bees. I refuse to sell bees to someone who will not take the time to attend a bee club meeting, do some studying, and ask questions. Of course there are those who thrive on these wannabees that buy bees from them every year. It is a source of money for the seller but it is very destructive to the honey bee population.

Think of it this way; would you sell puppies to someone that is only going to kill them or sell them to others for experimentation? Probably not, but that is what we do when we sell bees to someone who insists on learning on their own. Yes there are exceptions but I have never met one.

Another good point you make in your article is the time it takes to work with our mentees. They do ask all the questions you list and more and they ask the same questions multiple times in different ways and that keeps you on your toes. Some expect precise answers to questions that may have multiple answers depending on the time of year, location of the hives, ability of the mentee, and other variances that come up in beekeeping.

Bee schools are becoming more and more popular and they help new beekeepers gain some basic understanding. However, taking a class and reading books and papers does not instill the basic

understanding you gain by working bees and learning how different bees can react in situations. I tell my students that the bees do not read the books that are written about them. Bees do what they do when they want to do it and we need to learn from them.

Sitting at a hive for an hour and watching the bees work will do more for most students than reading books. Opening a hive and enjoying the smells and warmth of a hive is exhilarating to most new beekeepers. It helps them bond with the bees and want to learn more and do more to help protect them.

Another thing mentors need to know is that new beekeepers will call and email you at all times of the day and night with questions that need answered. They are very important and should not be ignored. Yes, mentors lose lots of sleep and spend a lot of time supporting the beekeepers they mentor, but that is what the job calls for.

If you want to mentor you must be committed 100% to be successful. And how do you know if you are successful? One of the easiest ways to measure success is to count the hives your mentees have at the beginning of the year and again at the end. If the number of hives has increased, you have done your job.

On the other hand you will have some folks who just can't seem to keep their bees alive. How do you deal with this? You can tell them to quit as they are not cut out to be a beekeeper, which does no good for their egos or the bees. It is much better to find the root cause (if you can) of why their bees died. Maybe they need to move their bees to a better location that gets full sun. Or maybe they need to stop putting so many chemicals into their hives that build up over time in the wax. Or maybe they just need

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to attend more meetings of a local bee club to learn more tricks of the trade that can help them become successful. All beekeepers lose bees at times due to circumstances beyond their control, but it should not be an ongoing problem.

Finding good mentors is not easy. Many mentors are just staying a few steps ahead of the ones they mentor. All clubs should have a program like we have started in our clubs called the SOBS. No, that is not what you might think though mentors are sometimes called this.

SOBS stands for "Save Our Bees Staff" and the folks who pass our course and become qualified to mentor others have shown they have the knowledge and patience to deal with the hurdles that go with mentoring. These mentors may not know how to read or write or pass a test at some bee school, but they have worked with bees for a minimum of five years and know how to keep bees alive. They know that none of us has all the answers, but we do know where to seek good information – and that is not YouTube.

A couple of years ago I did a presentation on this subject for the American Beekeeping Federation at one of their annual conferences.

I always keep in mind that we are all in this together and by helping one another we will help save our bees as well.

Chappie McChesney
Alachua, FL

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There Is A Bee Day

In the May 2014 issue of *Bee Culture*, a reader wrote in suggesting a Honey Bee Day. There is such a thing. www.nationalhoneybeeday.com/ It is co-ordinated by Mike Thomas of PennApic.

This reader and others can get involved by contacting him. National Honey Bee day this year is August 16, 2014.

Charles Breinig
Dresher, PA

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www.BeeCulture.com/BUZZ

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JULY – REGIONAL HONEY PRICE REPORT

Past and Future

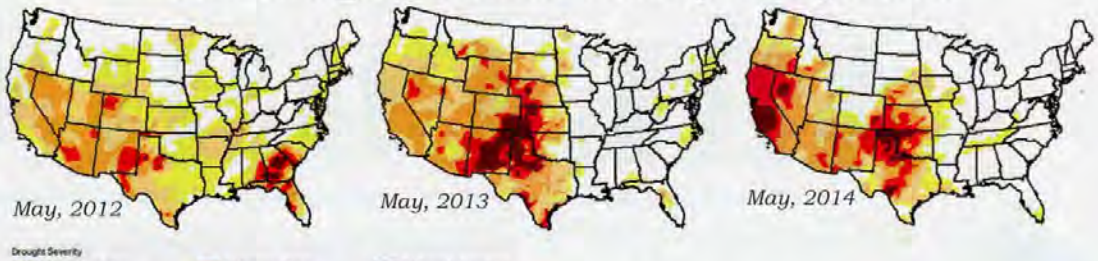
Where we've been. Look at the drought maps from May 2012, 2013 and 2014 and note the progression of dry across the country. It has eased off a bit this year, especially in the plains states, but the west coast has gone from bad to worse. The Dakotas should do better this season than last, and since a lot of honey is made there, that's good. But the whole west coast is drying up, and slowly blowing away.

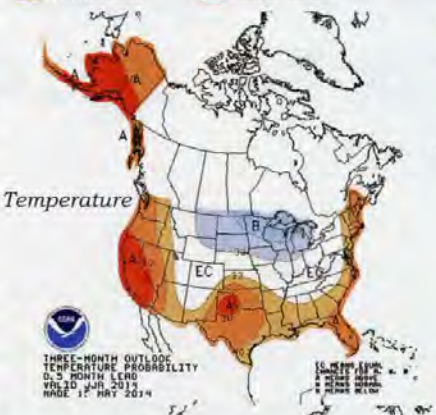
Looking at the Seasonal Drought Outlook from May 15 – August 31 – most of the honey season – the future isn't going to look much better, especially in the west and central south. The east looks wet enough.

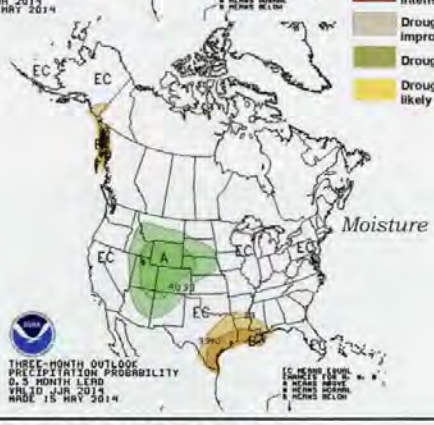
But then, look at the three month precipitation map for June, August and September. The areas that need water the most still aren't going to get relief, while the Gulf coast is going to get drier, June through December.

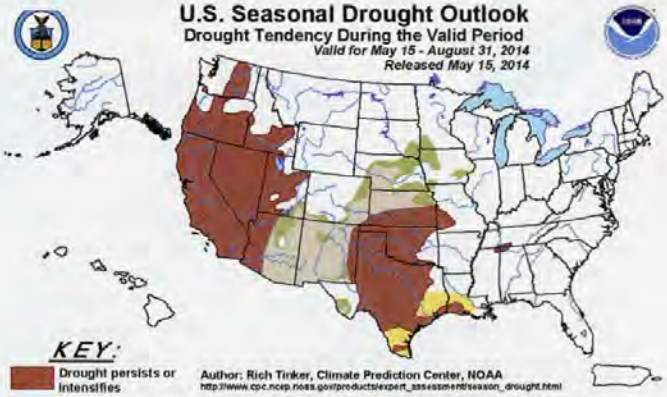
The temperature prediction map isn't encouraging either. The hot and dry get much hotter for the most part, and even the east coast looks to have a dry Summer June - September.

U.S. Drought Monitor Weekly Comparison









REPORTING REGIONS

	1	2	3	4	5	6	7	8	9	10	11	12	SUMMARY Range	Avg.	$/lb	History Last Month	History Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS																	
55 Gal. Drum, Light	2.55	2.45	2.08	1.98	2.40	2.27	2.30	1.25	2.00	2.25	2.28	2.45	1.25-2.65	2.21	2.21	2.22	2.02
55 Gal. Drum, Ambr	2.40	2.25	1.94	1.96	2.05	1.92	2.26	1.76	1.80	1.94	2.00	2.18	1.25-2.40	2.05	2.05	2.08	1.90
60# Light (retail)	223.50	213.75	175.00	193.75	180.00	197.50	191.88	170.00	132.50	171.00	180.75	240.00	90.00-270.00	192.11	3.20	190.62	176.81
60# Amber (retail)	214.67	210.00	175.00	189.25	180.00	173.33	187.00	170.00	126.50	178.25	172.75	180.00	78.00-270.00	182.50	3.04	181.42	169.00
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS																	
1/2# 24/case	90.57	79.19	66.80	71.50	77.21	60.00	60.51	77.21	77.21	51.84	86.40	101.00	45.60-108.00	77.62	6.46	76.60	67.86
1# 24/case	124.31	118.80	110.00	94.60	126.00	111.36	93.00	102.00	96.00	106.32	107.60	117.00	79.20-172.80	111.87	4.66	113.70	106.21
2# 12/case	113.65	103.30	102.60	86.00	121.50	92.76	80.94	105.00	78.00	97.44	96.00	101.33	70.00-144.00	99.64	4.15	97.90	95.01
12.oz. Plas. 24/cs	106.58	86.44	71.40	82.50	79.20	90.00	72.02	93.60	72.00	74.40	103.50	88.50	62.40-134.40	86.82	4.82	85.01	81.54
5# 6/case	140.34	124.04	100.50	88.50	126.00	126.67	95.20	112.50	90.00	102.30	110.40	120.00	83.10-192.00	115.79	3.86	114.33	105.22
Quarts 12/case	157.92	155.22	185.00	122.50	108.40	117.21	137.28	114.00	138.04	125.64	131.70	138.50	99.00-186.00	133.58	3.71	134.07	119.68
Pints 12/case	100.48	86.95	102.00	86.25	81.00	65.00	90.43	60.00	66.00	85.72	96.80	86.00	54.00-121.20	83.85	2.33	98.02	75.83
RETAIL SHELF PRICES																	
1/2#	5.21	4.63	3.64	3.82	4.37	3.50	3.32	2.99	4.37	2.96	4.25	6.00	2.12-7.25	4.06	8.12	4.13	3.96
12 oz. Plastic	6.41	5.13	4.03	4.47	5.00	4.63	4.03	4.50	4.50	4.44	5.57	5.75	3.49-8.25	4.88	6.10	5.07	4.88
1# Glass/Plastic	7.25	6.47	6.35	5.99	7.00	6.20	5.10	6.13	6.00	5.96	5.90	8.25	3.00-10.00	6.25	6.25	6.43	6.13
2# Glass/Plastic	12.92	10.67	11.28	10.09	12.00	9.80	9.21	12.00	10.00	9.08	10.20	15.00	6.00-18.00	10.74	5.37	10.65	10.16
Pint	11.00	9.95	10.50	8.11	8.00	7.39	10.22	6.10	6.00	8.80	7.63	10.45	5.79-13.90	8.57	6.98	8.84	8.07
Quart	18.60	14.15	17.00	14.02	15.00	12.98	14.50	15.63	17.01	15.44	13.52	15.73	8.50-30.00	14.76	4.92	14.62	13.15
5# Glass/Plastic	27.40	21.24	25.90	23.00	25.00	24.41	21.86	28.00	18.00	21.54	21.96	25.00	15.00-36.00	23.31	4.66	24.00	21.84
1# Cream	9.20	7.08	9.63	7.08	8.18	8.18	6.31	8.18	8.18	7.28	8.75	10.00	4.90-12.00	7.90	7.90	8.07	7.22
1# Cut Comb	10.38	6.00	9.63	8.00	8.58	6.00	8.74	8.00	8.58	10.00	9.25	12.00	4.50-12.00	8.90	8.90	9.07	8.52
Ross Round	10.00	9.95	8.25	6.50	8.82	8.82	8.00	9.50	8.82	8.82	10.50	8.82	6.00-12.00	8.64	6.48	8.56	7.97
Wholesale Wax (Lt)	6.90	6.88	6.00	4.88	3.20	4.78	4.98	5.50	7.00	6.00	3.84	4.75	2.85-11.00	5.45	-	5.57	5.12
Wholesale Wax (Dk)	6.00	5.45	6.00	4.55	3.15	3.75	4.44	5.00	4.80	4.80	2.53	4.00	2.00-8.00	4.60	-	4.58	4.43
Pollination Fee/Col.	97.40	68.33	100.00	61.00	90.00	50.00	61.50	85.00	96.37	80.00	129.00	137.00	35.00-185.00	82.73	-	81.60	79.29

New For The Summer –

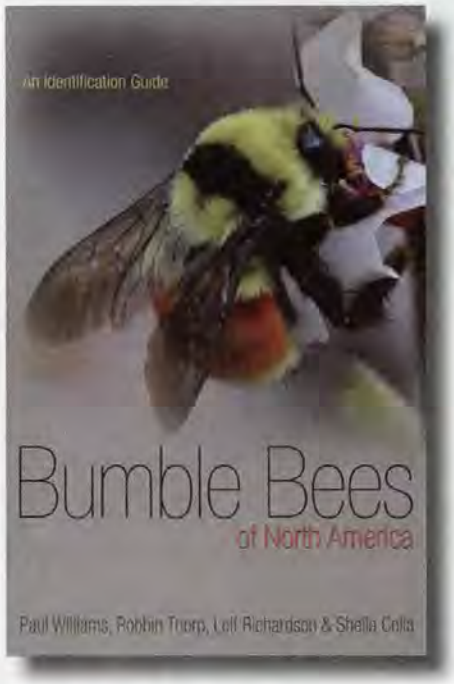
Beetle Baffle

If small hive beetles are causing trouble consider this fundamentally simple beetle excluder device for your hives. The concept is straightforward simple. Beetles enter a hive through the front door. They proceed across the floor of the bottom board and climb up (or are chased up) into the hive by crawling up the lip of the bottom board onto the inside surface of the bottom super until they can reach a frame, when they can go anywhere they want. The baffle stops them at their most vulnerable spot – leaving the floor of the bottom board as they try to get up into the hive. The aluminum slats stick out at the junction of the bottom board and super and prevent the beetles from leaving the floor because they can't climb over the obstruction. It's a very clever device. The cost is $16 (with out the spacer), and is available from **www.beetlebaffle.com**, or several bee supply companies. Watch the video at the web page for use and construction information.

Bumble Bees Of North America. An Identification Guide, by Paul Williams, Robbin Thorp, Leif Richardson and Sheila Colla. Published by Princeton University Press. 6" x 9", soft cover, color throughout. 208 pgs. ISBN 9780691152226. $24.95.

Bumble bees of North America draws on the latest molecular research to update our understanding of the species – did you know there are 46 recognized species in North America north of Mexico? These pages show the enormous color variation within the many species, and especially helpful, guides you through the many confusing convergences between species. Stunning photography, many diagrams, graphs and especially distribution maps.

The authors draw on a large collection of museum collections, and discusses the many ecological roles these important pollinators play in the scheme of things. An excellent key and the many photos make identifying these beautiful bees easier – but it's still a task for some.



OTS Queen Rearing. A Survival Guide For Beekeepers Worldwide, by Mel Disselkoen. 11" x 8-1/2", soft cover, color throughout, 95 pages, spiral bound. $49.99 plus postage from the author's web page **www.mdasplitter.com**.

Mel Disselkoen has been working on better ways to keep bees, raise queens and be successful for over 40 years. He developed the MDA splitter, a plain or waxed cardboard nuc box used by thousands of beekeepers, he pioneered the use of sugar blocks for feeding, and he has finally brought 40 years of observations and queen rearing experience together for this book.

The book gives backgrounds in non-grafting procedures of queen production including Doolittle and C. C. Miller, talks about swarming and queen replacement, and then dwells on his OTS (on the spot) method of queen production. Basically, a notch is made in the bottom edge in a cell with the right aged larva with a hive tool, right at the hive, and the bees (in a strong, healthy colony) proceed to draw queen cells right on the face of the frame. From there, "starts," as he calls them, are assembled and existing and new colonies continue on. Mel is very aware of seasonal differences in honey bee behavior, looking at what bees do before, and after the Summer Solstice – how they build populations, or don't, and how well prepared they are for winter.

Because of rapid population buildup, Varroa are less of a concern with this system, too.

The book also looks at some fundamental math – bees on a frame, how much brood, how to get good drawn comb and more.

I've not seen anyone approach this subject from this direction, but the biology and beekeeping make sense. And I've always admired the authors passion for the art, and science of keeping bees. Mel has a saying: Beehavers TAKE directions from bees. Beekeepers GIVE directions to bees. I think Mel is in the latter bunch.

INNER COVER

Two separate events occurred in late May that continue the evolution of how, and what people read. The first has to do with Amazon and a publisher based in France but with a huge American presence called Hatchette Book Group. Basically, Amazon, who has a 40% market share of new book sales in the U. S. and 60% of E-Book sales (does that make you a monopoly?), wants an even bigger discount on the E-Books published by Hatchette and sold through the Amazon web site. Amazon said more, Hatchette said no, so Amazon said OK, and they stopped selling some of Hatchette's books altogether – both paper or electronic – slowed shipping some of their titles, recommended other titles at less cost on author's pages, stopped taking preorders of others and ceased discounting the prices of others. When asked, Amazon said buyers could get those books from anybody else if they wanted them, but not here, or only here at higher prices. So much for Amazon's reputed customer service. Because, of course, anywhere else usually costs more, often much more because anywhere else has higher costs (and in Amazon's opinion everybody else cares less for their customers than Amazon) so they charge more. As a result Hatchette's book sales are suffering. But along with slagging book sales, Hatchette's authors are concerned since they make their living on the Royalties publishers pay them based on the number of their books sold. Fewer books sold, smaller, if any Royalty paid. So much for Amazon's concern for authors, too.

But Hatchette is also an owner or distributor for lots and lots of small publishers. And Amazon is considering putting the squeeze on everything Hatchette touches. Amazon figures that the more pressure they can bring to bear the more likely they are to give in. Plus, the more damage they cause this publisher, the less likely any other publisher is to confront them. So it's the very, very big putting pressure on the very big, and the very small. Why? Rumor has it they aren't making as much money as they would like. Because of their extremely thin margins they have to have extremely huge volume to stay afloat, and to grow. And growing is something Amazon does quite well – as long as the cash keeps rolling in. Books, however, are a small part of what they sell anymore, but the image, the culture and the emotional relationship of the company and its customers still centers around books, not diapers.

By the way, some of the books I have written over the years are distributed by Hatchette. I have a box in my living room right now full of the these books that has a great big H smeared on two sides as the logo for Hatchette Book Group. No, I don't know if sales have slowed, if the latest edition of *Backyard* was not being presold, or even not sold at all.

As an aside here, Amazon is also a publisher. They help authors self-publish E-books by the thousands and have sold millions of these independent titles. And they get a pretty good discount to do so. More now than when they first started it seems. Quite a bit more, which hasn't made any of the self-publishers happy either. And though they deny it, there's some evidence that prices on the web site are increasing.

But as of early June it's a Mexican Standoff to see who will blink. Hatchette is very big. Amazon is bigger. You, as a reader certainly benefit from Amazon's size because they can sell you books from publishers at their cost. Really. You'll get the best deal there is on almost any book available when you buy from Amazon. And some books you can only get through Amazon. But remember the discussion we had here a bit ago on trusting big? Keep it in mind. Could Amazon be the company you love to hate if they start holding the books you want hostage?

•

In a kind of related incident right at the end of May, the second largest wholesale magazine distributor in the U. S., Source Interlink Distribution (SID), closed their doors and laid off some 1200 full time, and 4800 part time employees. It happened pretty fast, and it went like this.

National distributors are used by magazine publishers like us for billing and collecting from wholesalers and other services, although they never touch the actual product. They essentially serve as bankers to the publishers, keeping tabs on sales and returns and doling out payments.

SID, if you haven't guessed, was one of a few of the distributors *Bee Culture* uses to get our magazine to a lot of different kinds of stores. For us, SID organized delivery to Barnes and Noble book stores, and to Costco, CVS, Rite Aide and A&P supermarkets, and handled Walmart stores in Pennsylvania and the South, plus Books-A-Million book stores and a host of others. We do have several distributors because some are regional and some stores don't want all their eggs in one basket. Because of this several distributors will deliver to Barnes and Noble for instance.

What went down with SID was that Time Inc. the behemoth book, magazine and entertainment business, was one of their customers. The biggest customer they had it turns out. They delivered *People*, *Us Weekly*, *Glamour*, *Cosmopolitan*, *In Touch*, *Men's Health* (and *Bee Culture*) among others, to a host of

Paper Vs. Electrons

outlets. National distributors organize the magazines we send to local distributors right from the printers. We pay the freight to get them to various warehouses all over the U.S. From there they are delivered to stores and other places where they are sold at retail. When a copy is sold, the store gets a per cent, the local distributor gets a per cent and the national distributor gets a percent, and what's left is ours. Those copies that remain on the shelf at the end of the month get trashed, or hopefully recycled. They pay us, the publishers, after the magazine is sold, sometimes long after the magazine is sold – long being three or four months. So in this traditional business model publishers get their money last, and they absorb any shrink and essentially trust the distributor when they say X many were sold, and here's your money. So publishers have a lot of money hanging for some amount of time, not doing them any good at all.

People magazine decided they wanted a different business model. Due to slowly declining sales at newsstands nationwide due to more and more digital readers (see Amazon, above), they wanted their pay up front they said, and we'll refund you the difference at the end of the month and the distributor eats the errors, the shrink and the postage. And all of *Time's* titles said essentially the same thing. All those titles generate millions of dollars every month even when on average only 35% of the magazines on a rack sell every month (and that decline continues, especially for consumer titles like *People*). *Time* wanted all 100% paid for up front and they'd pay the distributor for everything not accounted for as sold later. The Source didn't have that kind of upfront money and without Time Inc. as a customer, they closed shop.

Why is *People* magazine's business being discussed here? Well of course SID was one of our distributors. Maybe suddenly we won't be where we have been on some newsstands for a while. The good people who actually handle our distribution to these national distributors did a lot of scrambling when this all came down figuring out how and who to get this to work without losing a month or more of exposure. Time Inc. might take a big hit...two to three months, maybe more...but that's only 2% of their sales, so don't worry, they'll be fine.

This all happened after our June issue was put on newsstands and before the July issue was printed, so I don't know the final outcome. Since SID went belly up our long standing contract with them is null and void and we are free to shop around for new distributors. We have already signed contracts with distributors to cover some of our outlets, and we are in negotiations with others, and our biggest retailer wasn't affected by this. Certainly the remaining distributors know the situation we are in, yet each wants a chunk of any new business that comes along (and though our total numbers are small compared to, say, *People*, on average we do much better than *People's* average 35% sell through so actually we're a gem for these guys). Thus both sides are in both good and bad positions when it comes to negotiating services and prices.

All this started with the very real notion that the current and future world of the written word is changing. Amazon wants a bigger piece of E-Books because they already know that. Holding a hard copy, the traditional paper copy of a book or magazine is no longer the only way it is. Yes, a paper magazine in my hands is still one of life's treats, but the handwriting is no longer on the wall, but on Tablets, IPhones, IPads and all the other devices available. And these are only for today because the future is going to be yet more electronics. So don't get comfortable with those flip page digital magazines. If you don't know, be warned that they are already history and the new kid in town is as far ahead of them as the TV was to your high school ditto machine newsletter. We will all go kicking and screaming into the 22nd century and it will arrive nevertheless, with or without us.

When the dust settles magazines will still be on newsstands mostly the same as they were. Probably not as many, and even fewer and fewer as the weeks and months go on. But already there are fewer players in the distribution game so the big guys, of course, just got bigger. One of the biggest, if not the biggest is a business called The Jim Pattison Group, a magazine and book wholesaler with several magazine distribution divisions, each of which rivaled SID. You've probably never heard of them but combined they have $8.1 Billion in sales, 505 locations in the U.S., and 36,000 employees. They dwarf every competitor and are in the position of making the rules, any rules they want almost. What do you suppose they would do if a publisher wanted money up front? They have it certainly, but they also have the power to tell even Time Inc. I believe, to take a hike, or even like Amazon to Hatchette, "politely declined." One wonders what they will want when they figure that out. The big just keep getting bigger. Stay tuned.

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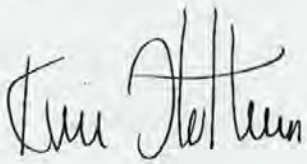
This is the month we celebrate the anniversary of the founding of our country. Maybe more than some, I enjoy the opportunities I have simply because I live where I do. Last weekend was Memorial Day as I write this and now it's the Fourth of July. In spite of all of the national political issues we wrestle with daily, we are fortunate to have what we do. It's not perfect, but it's so much better than almost anywhere else. Take a moment this month to reflect on our sameness, our good fortune, and not our differences.

From all of us at *Bee Culture* have a safe, sane and wonderful holiday. In the meantime, keep your veil tight, your smoker lit, and your hive tool handy.



It's Summers Time –

Garden, Observation Hives and Chickens

I hope your Summer is going well so far. We've had some heat and the rain has slacked off a little, so not too bad.

The first part of May we had some exciting tornadic weather. A funnel cloud was spotted in Medina County but mostly we had lots of water in the basement and a bunch of tree limbs down. No damage and no loss of power. We were luckier than some.

Because of all the rain early though we have not gotten the garden in and it's kind of looking like our garden this year is going to consist of tomato and pepper plants on the deck in pots. We even planted some corn in two big pots on the deck. So we'll see.

The big project for us over the next couple of weeks is to get the two observation hives that we manage up and running. We have one at the Medina County Library and one at the Root Candle Store. We've been doing this for several years and it's always a chore trying to get them through Winter. The one at the library is always struggling. The one in the store did OK this year, even making it through the very long Winter we had and then crashed. It doesn't take very long for an observation hive with only five frames to take a nose dive. There are feeders on both and the folks that take care of feeding them are very diligent about the task, but leave on Saturday with things looking fine and by Monday morning the bees can all be dead. It's that quick. Observation hives are tough because it is such an unnatural condition.

So we take them home, dispose of all of the dead bees and start over. We've got two nucs on our front porch, building up from packages to replace the observation hives. The hives are in the garage partially cleaned – that's the big task for the next few days.

The hive at the store has so much wax on the glass by the time Summer is over that you can hardly see the bees. As annoying as this is to clean up, it's very fascinating. Little tiny pieces of wax all over the glass surface. Not sure why, and not sure why the one at the library doesn't do this because the hives are identical. And it's a different group of bees every year with a different queen – so what's the deal?

Then we load them up with a couple of frames of honey, a couple of frames of bees and brood and a nice young, very clearly marked queen and haul them back to their homes – all the time hoping that this will be the year we don't have to worry about them.

The observation hives are very well received at both locations – by the public, but also by the ladies that work at both sites, and that are responsible for keeping an eye on them, feeding them and calling us when something doesn't seem quite right. Luckily the store is directly across the street from work and the library is about four or five blocks. So both are easy for us to get to.

There is a security company in Medina that has agreed to donate two cameras for the hive at the library. There will be one inside and one outside so you can go online and watch the bees in the hive and watch them coming and going. We got this idea from the Heritage Farm Museum in Huntington, West Virginia when we visited there last year. There is an app that you can download onto your IPhone to watch videos. There is a touchscreen that kids can use to go through a series of questions about bees. Over 8,000 kids visit in a year. You can visit at **www.heritagefarmmuseum.com/**. We hope that our Medina setup will get as much attention. We'll let you know the web address as soon as everything is up and running.

The chickens are doing great – by my standards anyway. This is their third Summer with us and from 11 chickens, we are averaging about six eggs a day. I suppose some would be sending them to the soup pot right about now, but that won't be happening with these girls. We enjoy them too much.

One of them, the only Rhode Island Red in the bunch, has become quite bossy. She's like that one kid in the group that just keeps everybody else agitated. I've watched them and she'll just suddenly give someone else a thunk on the head, for apparently no reason. I have also noticed that some of the others will eventually get tired of her behavior and give it right back to her. She's just being nasty – there has been no permanent damage to anyone.

I am a bit concerned about a rather large population of fox that we have in our vicinity. They've always been around, but they were never up at all close to the house. They tended to stay around the neighbor's pond and that's where she would see them when she would walk her two very large dogs. So I felt pretty safe, thinking the dogs are probably keeping them at bay. But now they've moved closer. Two mamas have had litters and they are under the neighbor's barn. No sign of trouble yet, so keep a good thought.

We have the NiteGuard lights around the coop and on our deck, where we used to get nightly visitors of various kinds. These lights seem to do the trick. There are no signs of any critters even coming close to the chicken coop.

Can you believe with this issue 2014 is more than half over? Enjoy the rest of Summer and have a happy Fourth of July. God Bless America!

Hardy Summers

The Pollinator Stewardship Council

FORAGE NEEDS TO BE TOXIN FREE

Stop The Poisoning!

Michele **Colopy**

Nectar and pollen are the honey bees' *raison d'etre.* Honey bees seek the plant in bloom with little discrimination if it is a weed, crop, ornamental shrub, tree, or flower. If there is nectar to be had, and pollen to collect the honey bee is pleased. Honey bees' and native pollinators' food source is pollen and nectar from plants in bloom. At this essential pollination moment for the plant the pollen and nectar must be "au naturel." If the pollen and nectar have been sprayed with a pesticide, if the pollen and nectar contain pesticides from the seed coating, it is not healthy food for pollinators. Crop pollination exposes honey bees to pesticides which alters their susceptibility to the gut pathogen *Nosema ceranae*, is research that found pollen contained an average of nine different pesticides, with a high of 21 pesticides. Pollen collected was not always from the crop the bees were to pollinate, *yet all of the pollen contained pesticides.* And, *"Nosema infection was more than twice as likely to occur in honey bees that consumed pollen containing fungicides."*

Honey bees need the nutritional properties of their food, nectar and pollen, in order to maintain healthy colonies. Amino acids, vitamins, enzymes, protein, carbohydrates comprise a healthy diet for pollinators. Mother Nature knows what is best for honey bees and native pollinators: the pollen and nectar with which both evolved in order for pollinators and plants to survive and multiply. Research is showing that this perfect food for honey bees is suffering due to acute/lethal and sub-acute/pre-lethal effects of pesticide residues in pollen and nectar.

The ever-expanding bandwagon of concerned entities to "save the bee" seeks a quick solution, but ignores the details and the long-term ramifications. Just planting milkweed and cone flower will not "save the pollinators." Monarchs that migrate across North America do not encounter one sole thing in their environment. (Although, Monarch larva eat only milkweeds. Adults, however feed on a variety of nectar sources.) Pollinators do not exist on one food source, nor can they be forced to change eons of a flight pattern to feed on a "pollinator reservation." Butterflies, like honey bees, bumble bees, and all pollinators encounter everything within their flight range. A flight range can be as small as one and half miles, or as great as the continent of North America. In this flight range for pollinators seeking food, we have realized human development, land uses, misuses, and over-use have affected the food supply of pollinators.

Pollinator health is suffering due to their food being tainted at the time they are collecting it; and because the seed or soil is saturated with a pesticide that translocates through the plant and into the nectar and pollen of the blooming flower. Pollinator health is suffering due to a singular food source when they pollinate crops. Herbicides are applied to destroy any wildflowers or weeds that may grow at field edges; some fields are planted to the edge obliterating any opportunity for another food source for pollinators. Many weeds are becoming herbicide resistant, with herbicide manufacturers seeking tolerance increases from EPA for herbicide applications. Depending on soil types, some herbicides can reside in the soil for a half-life of 47 to 147 days. Pesticides have a half-life of a few hours to a few months, to more than 1000 days depending on the active ingredient and the soil, water, and weather. Neonicotinoids, foliar and seed coated, have a very long half-life in the plant, the soil, and water, and do affect the health and mortality of honey bees and native pollinators.

The key to pollinator health is healthy food. We can have corporations planting flowers on their grassy lawns, but all of this effort will be for naught if the pollen and nectar are tainted by insecticides, herbicides, and fungicides in the soil and water of these pollinator habitats. A researcher at the Eastern Apicultural Society conference in 2013 stated if we turned all of the grassy residential lawns into pollinator habitat this country would have 20 million acres of "conservation land." And the U.S. is "losing 6,000 acres of potential monarch/pollinator habitat a day," states Monarch Watch. While pollinators should be everywhere, they are not. Planting forage land in urban and suburban areas will help the backyard beekeepers, and native pollinators. The real need, however for pesticide free forage is in agricultural areas where on average 1.5 million hives are brought in to pollinate crops. The native pollinators have been driven out of these areas due to loss of habitat and loss of food. No living creature can survive on one food source in bloom for a month or less each year. Pesticides have been used prophylactically in agriculture, and less and less as part of a strict IPM program. Agricultural areas have become

food deserts for pollinators, due to the eradication of diverse floral food sources for pollinators, and systemic pesticides that make a crop (and adjoining wildflowers) toxic during the bloom. Any pollinator habitat we create must be free of toxins in the food of honey bees: pollen and nectar. To use an extended residual toxicity herbicide on a grassy lawn, and then plant pollinator plants, is as cruel to pollinators as purchasing "bee-friendly plants" with soil soaked in neonicotinoids from the local nursery.

Research of *Four common pesticides, their mixtures and a formulation solvent in the hive environment have high oral toxicity to honey bee larvae* found *" . . . pesticides, formulation additives and their resulting mixtures may have greater long-term impacts on colony health than previously considered . . . the scope of pesticide risk assessment for non-target honey bees should be expanded from the present emphasis on acute toxicity of individual pesticides to a priority for assessment of chronic and mixture toxicities that incorporate fungicides, other pesticide pollutants and their "inert" ingredients."*

Beekeepers work with farmers to ensure their vegetables, fruits, and nuts get pollinated. Beekeepers realize crops need to be protected from pests, and encourage the judicious use of pesticides. To protect honey bees and native pollinators, pesticide applications must be timed away from the bloom cycle to ensure healthy pollen and nectar. To protect honey bees and native pollinators use non-systemic pesticides on bee attractive crops and plants, and use them after the bloom. Timing is key to protecting honey bees.

We can plant forage, we can plant bee friendly plants on former lawns, under utility right of ways, along roadsides. Restoring habitat at least acknowledges pollinators are important to the entire environment. All of us do benefit from the diversity of flowers and crops made possible by managed and native pollinators. We can create "forage reservations" or safe places for pollinators and beekeepers, forcing them to reside in a specific and limited area, ignoring the migratory patterns of native pollinators, rationalizing these "forage reservations" will save bees, but yet continuing to decimate pollinators "off the reservation." All pollinator forage: crops, weeds, wildflowers, ornamental shrubs, and trees must be pesticide free during bloom. The pesticides cannot be trans-located through the plants, due to previous use of the land, or through the preparation of the land for pollinator habitat.

Beekeepers continually seek pesticide free, diverse forage for their bees whether they are pollinating crops or making honey. State and local beekeeping associations have been sounding the alarm about bee forage, pollinator forage, and working at the state and local level to improve their communities. Pollinators are a part of our communities; beekeepers are a part of our communities. Our honey bees, butterflies, and hummingbirds need healthy, pesticide free food available to them during bloom. To protect pollinators, to improve the health of pollinators, do not apply toxins to crops or weeds during the bloom, and do not apply toxins to plants that make them toxic during bloom. Pollinators must be protected all year long in every setting in order to be abundant and healthy for the essential pollination moment. BC

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A Closer Look

THE HONEY STOMACH AND PROVENTRICULUS

Clarence **Collison**

A complicated, but necessary system.

The honey stomach, or crop, of the honey bee is the structure used to carry nectar collected from flowers back to the hive. It also holds honey ingested in the hive that is used for energy during flight and water that is collected by workers in the field for hive temperature regulation (Winston 1987). The honey stomach is not a true stomach since no digestion occurs there. The honey stomach is an enlargement of the posterior end of the esophagus in the bee abdomen. This expandable and collapsible structure can vary from being a flabby crumpled sac to a tight sphere (Morse and Hooper 1985). When full, the crop occupies much of the abdominal cavity, which expands by stretching the connective membranes that hold the abdominal sclerites together (Winston 1987).

The elasticity of the crop is afforded by a passively stretchable epithelium, whereas contractibility is afforded by an external wrapping of muscles that contract as needed to expel the contents (Sammataro and Cicero 2010). The wall of the crop consists of three layers (Brosch and Schneider 1985). The innermost layer is referred to as the epithelium with its cuticular intima (innermost layer of an organ) that faces the lumen (inside space of a tubular structure). The epithelium in turn is externally surrounded by two muscle layers, an inner longitudinal layer and an outermost "circular" layer. Hemolymph (blood) fills the spaces between muscle fibers. The epithelium of the empty crop is extremely folded and that unfolding allows for extensive stretching during the filling process. During engorgement with nectar, the muscular enclosure relaxes to larger and larger diameters. Correspondingly, pleats unfold as needed. During dispensation of nectar in the hive, the muscular enclosure contracts and forces the epithelium to pleat itself again. Pleats are present in even the most grossly distended crops, indicating that capacity is not a limiting factor in the volume of nectar a bee can accumulate during foraging. Individual pleats are appressed, too, indicating that a lubricating, cohering substance occurs between them. When individuals were depleted of their nectar reserve, the crop was contracted into an urn shape (Figure 1). When individuals were engorged, the crop was distended to a volume ≈ 10 times larger. Distention was not radially uniform (Sammataro and Cicero 2010).

The proventriculus (Figure 2) is a plug-shaped, hollow, muscular tube projecting into the crop on one end and into the ventriculus (true stomach) on the other end and it acts as a filter between the two, removing solids from the contents of the crop. This is done by means of four independently moving triangular lips which trap solids with their fringes of hair and pass them down into four small cavities. Any accompanying fluid is squeezed back into the crop. When these cavities are full the almost dry contents are passed into the ventriculus for digestion or disposal. Solids as small as one thousandth of a millimeter are filtered out. When the bee needs to take in fluids for digestion, the whole organ gapes open and the required quantity is allowed through into the ventriculus. The flaccid, less muscled tube which extends into the ventriculus acts as a non-return valve preventing the return of partly digested material to the crop. When required, the contents of the crop can be regurgitated by means of the muscles of the crop and the esophagus. By this means nectar is passed to house bees by returning foragers or in times of great nectar flow, placed in cells for temporary storage (Morse and Hooper 1985).

"The honey stomach is an enlargement of the posterior end of the esophagus in the bee abdomen."

Roces and Blatt (1999) analyzed the factors controlling the activity of the proventriculus by comparing crop emptying rates in workers collecting sugar solutions of a wide range of concentrations. In order to work out the underlying control system, crop emptying rates of bees injected either with metabolizable or non-metabolizable carbohydrates were compared. The interplay between physical and chemical properties of the ingested solution was investigated

by comparing crop emptying rates of bees fed with solutions of equal viscosity but different carbohydrate content. Crop emptying and rectal filling rates were investigated in bees trained to collect defined amounts of sucrose solution. Crop emptying rates strongly depended on the sucrose concentration of the collected solution. There was a close match between the energy expenditure of the bees and the amount of sucrose transported through the proventriculus, irrespective of the fluid dilution. Results indicated that the controlling variable was the amount of sucrose flowing through the proventriculus rather than the volume flow. Only the injection of metabolizable carbohydrates modulated the activity of the proventriculus, indicating that the titers of metabolizable carbohydrates are involved in the feedback loop controlling crop emptying, and that hemolymph osmolality alone does not influence the activity of the proventriculus.

Additional studies were conducted to further elucidate the mechanisms associated with crop emptying and working of the proventriculus in foraging workers (Blatt and Roces 2002ab). Again, individual bees were trained to collect defined amounts of sugar solutions. Following feeding, they were dissected after fixed periods of time in order to measure crop content and hemolymph sugar titers. Between feeding and dissection, the metabolic rate of every investigated forager was measured using open-flow respirometry, so as to assess the effects of both food quality (concentration, molarity and viscosity of the fed sugar solution) and food quantity on the transport rate through the proventriculus (Blatt and Roces 2002a). The sugar transport rate through the proventriculus was observed to be mainly dependent on the metabolic expenditure of the individual. Bee foragers were able to precisely adjust the sugar transport rate to their metabolic rates, but under certain conditions, an excess of sugars was transported through the proventriculus, more than needed to cover the bee's energetic demands. The excess depended on the nutritive value and quantity of the fed sugar solution, and on the time after feeding. It did not depend on the metabolic rate of the bee, the molarity, or the viscosity of the fed sugar solution.

"The proventriculus is used to engulf pollen and other particles which contaminate the nectar carried into the crop."

The fine structure and function of the proventriculus were studied by scanning electron microscopy and video-recording (Peng and Marston 1986). Observations revealed that the proventriculus is used to engulf pollen and other particles which contaminate the nectar carried into the crop. The four lips are closed and opened, pulled backwards and straightened by the external circular muscles and internal longitudinal muscles. Combs of filiform-hairs (70 µm in length) located on the margins of the lips 'catch' and filter particles from the fluid. By repeated filtering, opening and closing actions of the hairs and lips, particles are filtered and collected in pouches between the ventricular folds to form boluses and are eventually passed into the ventriculus (Figure 3). In the present experiment, particle sizes ranging from 0.5 to 100 µm in diameter, including dandelion pollen (*Taraxacum officinale* Web.), Torula yeast (*Candida utilis* Lodder et Kreger-Van Rij), bee disease spores of *Nosema apis* Zander and American foulbrood, and man-made particles can be filtered by the hairs. Small particles (0.23 µm in diameter) filter through the hair and return back to the fluid. Large particles (100-200 µm in diameter) are caught between the stylets of the mouthparts and are not ingested. These observations suggest that the particle size plays an important role in determining what can be taken in by the mouthparts and proventriculus and what can later be utilized as a food source by the bee.

Hazel pollen and pollen taken from the pollen baskets of bees were stained bright red with magenta red, suspended in clear syrup and fed to starved individual worker bees from a capillary pipette (Bailey 1952). Observations were made on the passage of pollen through the ventriculus, and the action of the proventriculus and honey stomach. When the bee was fed with the pollen suspension, pollen was seen passing into the crop within a second or two and the crop distended rapidly. Pollen became distributed evenly throughout the crop and remained so dispersed until only a few grains were left. The crop was seen to be continually writhing and pulsating vigorously. This action was so strong that the pollen grains could be seen moving about inside, and the action obviously kept the crop contents well stirred and the pollen grains evenly distributed. The proventriculus itself never moves as a whole relative to the honey stomach, although it may be moved to some extent by the powerful activity of the crop.

Pollen was seen to accumulate rapidly in the proventriculus. At first this accumulation took place in four 'cheeks' or pouches, and these rapidly filled with tightly packed pollen. These pouches seemed to separate and then to collapse together, with a gradually decreasing amplitude as the proventriculus filled with pollen. It appeared that the proventriculus was filling and emptying. However, the emptying was not into the ventriculus but back into the crop. When syrup, which had been stained deeply with gentian violet, was fed to

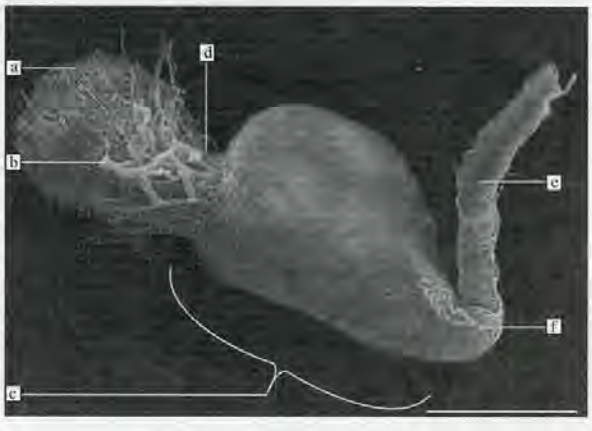

Figure 1.- *Scanning Electron Micrograph of a depleted honey bee honey stomach (crop). Lateral view, (a) Apex of severed ventriculus (midgut). (b) Trachea (c) Ventral surface. This is the shortest distance between proventriculus and esophagus. During engorgement, most of the inflation occurs dorsally, where the opposing face distends outward. (d) Proventricular constriction (e) Esophagus (f) Axonal trunk. From Sammataro and Cicero 2010.*

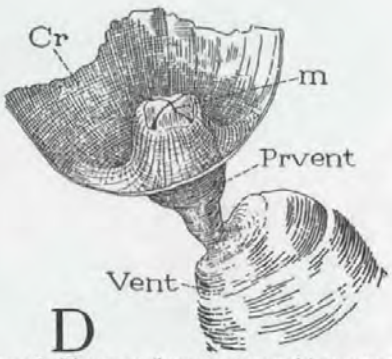

Figure 2. *The crop (honey stomach), proventriculus and upper end of ventriculus (true stomach) of a worker honey bee. m = mouth of proventriculus. From Snodgrass 1956.*

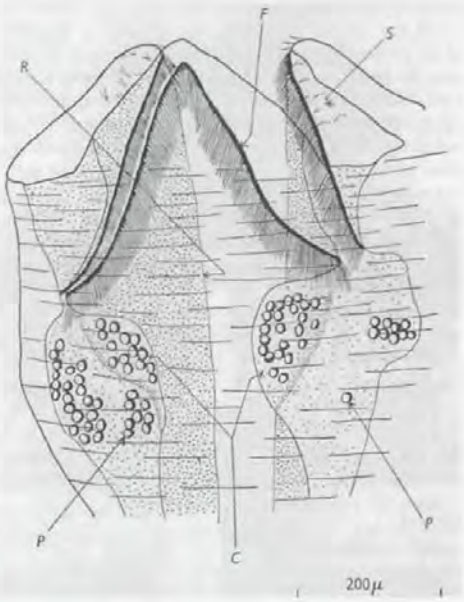

Figure 3. *Outer view of proventriculus. The front lip and the two associated pouches behind are omitted to avoid confusion. F = fringe of hairs; P = pollen grains in pouches and S = short spines. From Bailey 1952.*

the bee, the filling and emptying of the crop could be seen quite clearly, but the dark ball of syrup in the proventriculus disappeared when the organ emptied and usually did not pass to the ventriculus. Occasionally, however, a bolus of dark syrup moved down the neck into the ventriculus.

After a while the proventriculus was packed with pollen, with a solid core as well as the full pouches, and eventually the whole mass passed as a bolus (mass of food) down the neck into the ventriculus. The movements of the lips during these processes were asynchronous. They snapped open and closed very rapidly but individually. They appeared to be letting pollen suspension into the proventriculus during the expansion process by the movements and to be guarding against the ejection of grains back into the crop (Bailey 1952).

The volume of fluid within the honey stomach, the size of the particles in suspension, and their concentration have significant effects on the rate and efficiency of filtration by the proventriculus (Bailey 1952). BC

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Do Bees Pant?

Ian **Stell**

We often notice a bee, perhaps resting near the hive in a pool of sunlight, appearing to pant, with the abdomen pumping in and out (*figure 1*). So are we watching the bee getting its breath back?

Bees, like all insects do not breathe through the mouth, and indeed do not have lungs at all. They breathe through spiracles, a series of small openings along the body. The air passing through the spiracles is led into a network of tubes (tracheae) and air sacs (known as tracheal sacs) (*figure 2*) and ultimately to minute tracheoles (*figure 3*) which lead right into all parts of the body, even penetrating inside muscle cells. One of the fundamental differences between insects and vertebrates is that insects do not carry gases around in the circulation, but instead bring air directly to the tissues of the body. Vertebrates exchange gases from air to blood in the lungs binding oxygen to a carrier molecule, haemoglobin, and pumping it around the body in the circulation. However in insects the air is carried internally as a gas, throughout the body. Tracheoles take air close enough to all the tissues for oxygen to diffuse across cell membrane, and carbon dioxide to diffuse back.

Figure 2

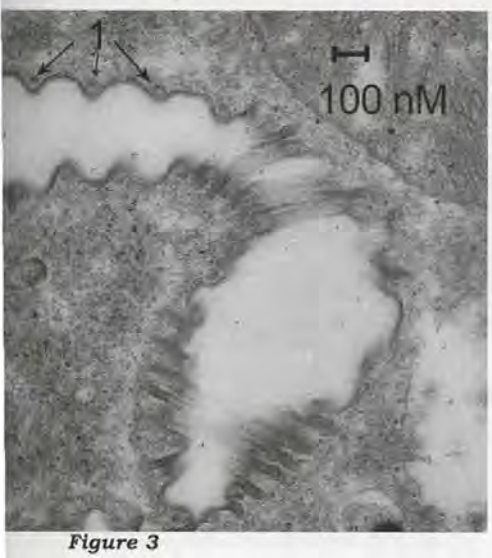

Figure 3

There are 10 spiracles in total on each side of the bee's body (*figure 4*), three in the thorax, six along the sides of the abdomen, and a final pair opening within the sting chamber. Two of the spiracles in the thorax are worth particular mention. The spiracle furthest forward just beneath the root of the front wing, and covered by a lobe of protective cuticle, is a large spiracle and is important in both inward (inspiration) and outward (expiration) movement of air to the head and respiratory muscles. The third spiracle on each side of the thorax, behind the wings, is the largest spiracle of all and is important in expiration.

Two features of the respiratory system which are relevant to this discussion are the tracheal sacs and the valves within the spiracles. These are important in creating the flow of air, and in directing it correctly through the body. The main driving force to air movement through the

Figure 1

respiratory system is the expansion and contraction of the abdomen produced by opposing sets of muscles connecting the hard cuticle plates. As the abdomen expands a negative pressure is created within it which enlarges the tracheal sacs and causes air to flow in through the abdominal spiracles. As the abdomen is contracted by another set of muscles, the pressure within the abdomen rises and air is squeezed within the tracheal sacs. At this point the bee can close the valves in the abdominal spiracles so little air leaves through them. Instead the air travels within the tracheal network both into the abdominal organs, and through two large tracheae into the thorax.

When bees are at rest their metabolic activity is relatively low, and cycles of respiratory activity of the abdominal muscles are slow, intermittent and gentle. At rest the valves (*figures 6 and 7*) of the spiracles operate so that most inspiration and expiration occurs through the

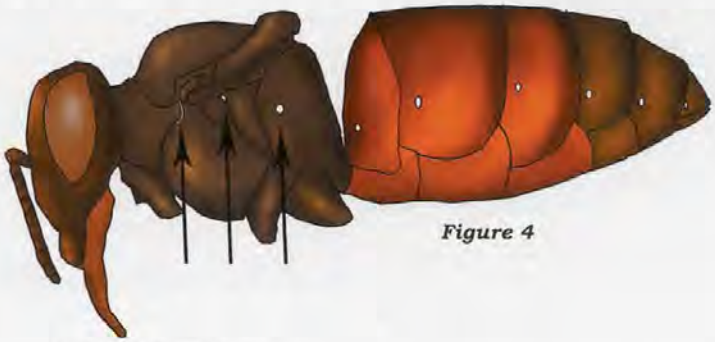

Figure 4

Figure 5

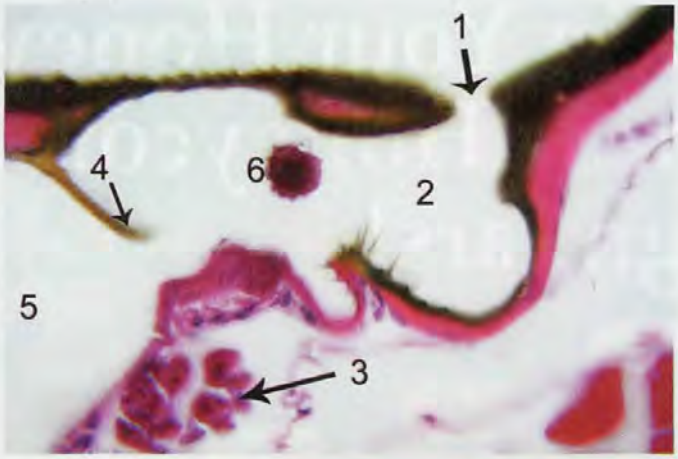

Figure 6

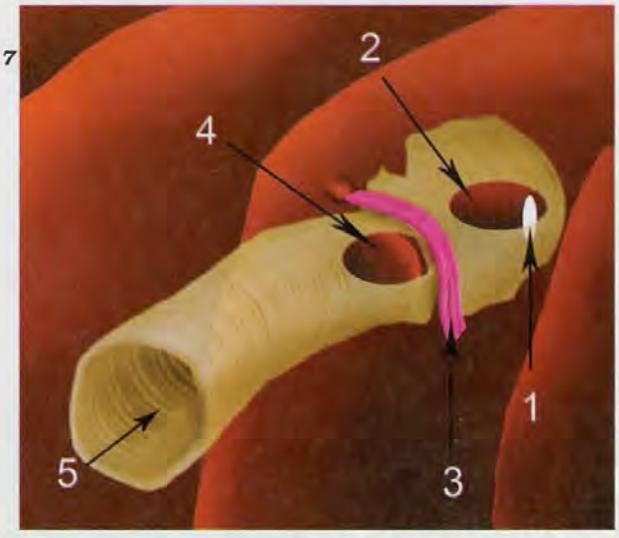

Figure 7

first thoracic spiracles, but some expiration also occurs through the abdominal spiracles and there is a movement of air from the thorax to the abdomen. However when in flight the metabolic activity of the indirect flight muscles increases over a hundred fold producing large quantities of carbon dioxide, and requiring a constant supply of oxygen. Under these circumstances the abdominal expansion and contraction is continuous, strong and rapid, reaching respiratory rates of 150 breaths per minute. Air is then drawn in both through the abdominal spiracles and the first thoracic spiracles. The co-ordinated activity of the spiracle valves directs the air movement forwards or backwards respectively so that nearly all of it is expired through the third thoracic spiracles.

Bees can provide nearly all the oxygen required by the flight muscles at peak exercise levels. But some 'oxygen debt' can arise from anaerobic (as opposed to aerobic metabolism). This is similar to the situation in vertebrates where continued increased levels of breathing are needed for some minutes after exercise to complete the metabolism (of lactic acid). So in answer to the original question, yes, bees do pant after exercise as they do need 'to get their breath back', but they recover quickly. BC

Ian Stell is the author of Understanding Bee Anatomy, A Full Color Guide. *Available from* Bee Culture's *Book Store and other book dealers.*

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Making Summer Increase

EQUIPMENT PREPARATION
ARRIVING AT THE APIARY
FOLLOW-UP INSPECTIONS

LARRY **CONNOR**

Summer increase colonies are easy to make up for most experienced beekeepers. Here are some steps that I suggest you follow, beyond what was covered in the earlier chapters, and later modify to fit your own management style.

Equipment Preparation. You may want to make up double four- or five-frame nucleus boxes from eight- or ten-frame equipment, depending upon your equipment inventory and your perceived needs. Many beekeepers divide ten-frame, deep hive bodies with a solid board running from the bottom board to the top of the box. You can cut inner covers from animal feed bags which allow you to inspect one nucleus in the box without disturbing the other. Some use a solid piece of Masonite™ or plywood cut to fit between the division board at the top of the frames. An outer cover is placed over both boxes. Unless you are using the Doolittle brood-above-the-excluder method just described, staple or nail the bottom board to the box, checking to make sure that the divider is bee tight (this may be done by routing a groove for the divider to slide into). Fill this box with a mixture of drawn combs and frames containing foundation. Ed Simon has reviewed some simple-to-make nucleus equipment in his book *Bee Equipment Essentials*.

To reduce the chance of injuring the queen cell or the queen herself, and to make manipulation much easier, I often use nine frames in 10-frame equipment. With the divided nucleus box, you may use five frames, or increase the spacing by using four frames on each side. Do not make up special equipment with unusual dimensions – keep in mind your cross utilization elsewhere in your beekeeping operation or future resale value.

Some beekeepers use special division board feeders in the nucleus box. They fill it before they add the queen cell. A few Summers ago, we had a dearth in the Summer and Summer feed was essential for new colony growth. An entrance or hive top feeder may also be used. A frame or two of honey taken to the apiary, or removed from a strong colony, will guarantee a food supply. That said, nothing ensures the success of increase colonies as a nectar flow does. The colony will grow rapidly and be ready for more space very quickly.

Arriving at the apiary. With all the equipment loaded into a vehicle, the beekeeper is ready to work. If the apiary has been managed so that colonies are about the same strength level, you will be able to remove the same amount of brood, bees and stored honey from each unit. Take what the colony can spare to reduce the swarming instinct from developing but you do not want to weaken the colony so much that it does not produce a honey crop.

Systematically work one hive at a time. Remove whatever frames of brood the colony can spare; usually two or three frames per hive. Also collect frames of honey. Replace the brood frames with drawn comb so the queen will immediately lay into it. If there is a nectar flow underway, replace the honey frame with foundation to increase your number of new frames. Make sure to keep the brood together and not divide it unintentionally. I place drawn comb on the outside of the brood nest and foundation outside that. Drone brood foundation may be added if not already present.

Inspect each frame for a queen. If you are not using the Doolittle brood-above-an-excluder system mentioned earlier, carefully check each frame for a queen as you remove it from the hive body. As you place frames in the box, inspect each frame again for both the queen and for queen cells. If you find one queen, look for another. Between 10% to 20% of all Spring colonies have mother-daughter queens laying in close proximity to each other.

Add brood and bees from multiple hives if needed. Once filled, place the lid on the colony and screen the entrance, placing the colony in the shade if it is to be moved to another location. If it is to stay in a permanent site within the same apiary, move it to that location and restrict its entrance.

What strength? As colonies are made up, they may be custom made for the strength needed by the beekeeper. Many increase colonies are often made up lighter earlier in the season because the colony has a longer time period to expand its population. If you seek full production colonies, however, add six or more frames of brood and two or three frames of honey and

Full double with queen cell.

Each side is occupied with a separate queen, with no pheromone communication betwee units.

Setup for a double nucleus.

pollen. If you wish to install queens or queen cells and keep them for production colonies later in the Summer, make up the nucleus colonies with two partial frames of brood, a frame of honey and an empty drawn comb. This will allow the queen an adequate population to support growth but not become so strong as to swarm. If you want to mate the queen in a smaller unit and later move it to 10-frame equipment, add three frames of brood and one frame each of pollen and honey. As you make up these colonies, make sure you move primarily sealed and emerging brood. Look for queen cells in development on any frames since this may interfere with queen or cell acceptance.

Reduce the entrances. Robbing from other colonies is a real problem with small colonies. Once robbing gets started in an apiary, it can be very destructive. This may be avoided by keeping the entrances of smaller colonies reduced with a block of wood or screen. This allows a smaller number of guard bees to protect the colony entrance. If the hives are located in the sun, consider using window or small mesh screen as part of the entrance reducer so the bees are able to get adequate ventilation. Adding screened vent holes helps too.

In areas of chronic robbing, use a robbing screen. These work by allowing the bees inside the hive to fly in and out of the hive using a variation in the entrance. Robber bees are attracted to the odor of a colony, so place screens so they are unable to enter the hive.

Add cell or queen. Once a group of bees have been queenless for several hours, it is safe to introduce a queen cell or a queen in a push-in cage. Many beekeepers do this at the time they make up the colony, relying on the general confusion and mixing of bees to ensure queen acceptance. A cell protector that fits around a queen cell but allows the queen to emerge may be a suitable compromise for those worried about the 'foreign' queen cell being destroyed. Personally, I add queen cells after

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Robber screen from Brushy Mountain. (photo by Phil Craft)

the nucleus or full-sized colony is in its permanent location, either in the same apiary or in another location. This will add several hours to the queenless period, and seems to reduce queen introduction problems.

The use of different colored plastic cell cups allows you to identify the breeder queen or line you grafted from. If you move frames of brood from colonies undergoing swarming, mark the top of the frame with a colored thumbtack. This mark will identify the colony from which you removed the frame.

Using virgin queens. Some queen producers emerge queen cells into small cages in cell builders or vials stored in incubators. I have used small emergence cages for four years, producing thousands of virgin queens. These virgin queens may be successfully used in increase colonies if introduced with a candy or marshmallow plug at the end of the cage or the holding cylinder.

Once sited. Leave the increase colony alone so the queen is able to emerge from the cage and become established. If already mated, she should be laying in several days and may be checked, quickly, in five to seven days for acceptance as evidenced by normal egg laying in the brood cells. If you have used a virgin queen or a queen cell, allow three weeks before you check for a laying queen. Allow the queen to emerge, mature, mate and initiate laying. Waiting three weeks before removal is better for the queen, nucleus and the colony the queen is installed into as they mature together.

Follow-up inspections. Let the queen fill the colony with brood and, about four weeks later, evaluate her performance for brood pattern, appearance of newly emerged worker bees, and the appearance of any problems. Make sure the colony continues to have adequate food reserves (one honey frame in five-frame nucleus and three frames in a nine- or 10-frame hive). Queenless colonies should be stacked on top of a strong colony. Watch for wax moth and hive beetle larvae in queenless colonies. BC

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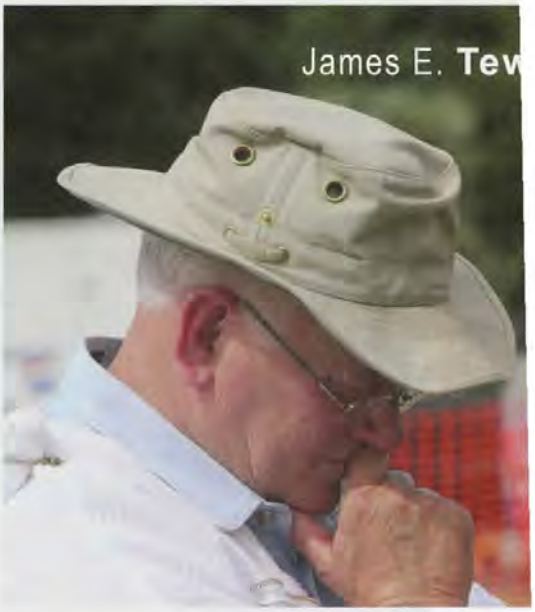
A Good Day In The Beeyard

Thoughts from the apiary



I have complained mightily

In *Bee Culture* articles past, I have complained long and loudly about dead and dying bees. To all those readers who sympathized with me, I thank you. With high Winter loses now being *"average,"* most of us know the feeling of wasted effort and dead colonies in the early Spring.

The past Winter was one of the worst in many, many years. I fully expected everything bee related to be dead, but as I said in last month's piece, I was surprised and duly impressed that any colony could survive the bitter cold. Some of them are truly tough, but some others are truly dead. Of mine that survived, they fall into the typical 1/3 category. One-third is challenged, one-third looks okay and 1/3 is crazy strong. My energy has now shifted from Winter survival to swarm control and colony buildup.

Honestly . . .

Though I am the author of this article, I hope that does not imply that I feel I am laden with answers to all bee questions. We are all in this together and as is shown below, I value the input and suggestions that you occasionally offer both me and other readers. Precious few things are now sure things in today's apiary.

Drones . . . Again

It's the drones again. In my last piece, I got all sappy because I was seeing drones last Winter. You had told me they were there, but I had never seen them. I photographed and wrote about them. Then, I got really carried away and wrote a lot about drones. So what else could be written now?

As the 2014 Spring season progressed, there was the drone issue again – but different. Poorly formed drones, fully formed drones, and parts of drones began showing up outside some of my hives in April. *(Pardon me if I panic.)* I have had really nice colonies crash and die – probably due to rampant *Varroa* populations. I know what can happen to a colony when things don't look right.

After reading and writing and listening, I thought I had a plan for mite suppression. Yet here were dead drones early in the season. Sugar shakes and observing torn drone brood cells for an analysis of the mite population revealed that there were acceptable mite levels in my colonies. A thought began to form, *"I'll bet these drone deaths are weather related."* But as usual, I had no proof. In reference to my section above where I said I value the input of other beekeepers, I was phone-talking to Peggy G. about bees and drones. She said that she felt that the late season coldness and persistent rainfall caused the colonies to second guess their commitment to drones at that time. I agree.

It would appear . . . if the Spring weather is good and resources are abundant, early Spring drones are tolerated. However, if anything turns bad in a marginal colony, the drones are tossed – even though it is early Spring, but I have no proof.

Dead drones along with other dead and dying bees can mean food stores are low or that mite parasite populations are high. In the Fall

An evicted April drone.

A worker bee apparently killed by late cold weather.

months, drone destruction is normal. Now, it would appear that drones can be destroyed at other times of the year when resources are tight. It *appears* that way but, as you know, it is commonly said that appearances can be deceiving.

In the same vein . . .

A camera is part of my beekeeping equipment. It is a very useful tool that really slows you down and annoys the bees, but where would I be without mine? When I was photographing drones, I also took pictures of other bee stuff of interest. It would seem that drones are not the only sufferers of late season cold snaps.

On several frames from some of my average colonies, I kept seeing uncapped workers that were fully formed but apparently dead. Not a lot, but not really uncommon either. Upon pulling the dead bees from the combs, I noted their wings were fully formed. This could have been effects of a *Varroa* infestation, but not the typical symptoms. Since my mite levels were manageable, I decided on a *"no"* for that possibility.

Commonly, I see such trapped uncapped adults when *Galleriasis* is the problem. In this instance, wax moths tunnel right through capped pupae. The web cocoons hold the bee fast in the cell – if she survives the tunneling. Pulling the trapped bee from the cell, she will readily show signs of wax moth silk and the mutilations will be obvious. Since this is all happening near the comb midrib, bees have a difficult time controlling the tunneling pest. But when I removed the trapped bee, there was no sign of wax moth damage.

Just as I wrote above, a thought began to form, *"I'll bet these worker deaths are weather related."* It would appear that during some of the late season, very cold snaps, some of the outermost pupae were chilled to death. Survivors have been working clearing the corpses, but these few still remained.

The surrounding capped workers are also dead. The erratic openings in the cappings are strong clues that the bees inside are not healthy. This hygienic behavior is also expressed in other situations such as American Foulbrood (AFB) situations, but clearly this instance was not AFB. Not only were some drones affected, but developing workers were also killed. For now, that is my guess.

The brood capping holes are centered and somewhat symmetrical.

Open holes in cells is a normal occurrence

As we all know, bees work as part of a greater unit. There must be some tasks that are completely accomplished by a single bee, but most jobs are accomplished by multiple bees doing individual parts of the task. Capping cells seems to be one of those tasks done by multiple bees.

As a larva matures and enters the pupation phase, it stretches out, headfirst, in the cell. Though no one knows their motivation, some nurse bees sense this phase and begin to cap over the cell – but not all at once. I have no idea why this takes some time – maybe resource availability. Additionally, I don't know how long it generally takes for a cell to be completely capped, but surely it's only a few hours.

New beekeepers are sometimes confused, having been told that partially uncapped cells are a bad sign, and that's true. Much of the time, partially uncapped cells are a bad indicator. But during the last phases of capping, a brood cell will briefly have a clear hole in the center of the brood cell.

These holes represent a work in progress and not a regression to earlier phases. They indicate a healthy colony that is moving in the right direction.

Combs and comb replacement

Being brutally honest with you, comb replacement is much like queen replacement. Both should be replaced on a regular timeframe, but it's just so dratted difficult to do. It seems that I can always justify putting these tasks off just a while longer. I know I should not procrastinate until harm is done.

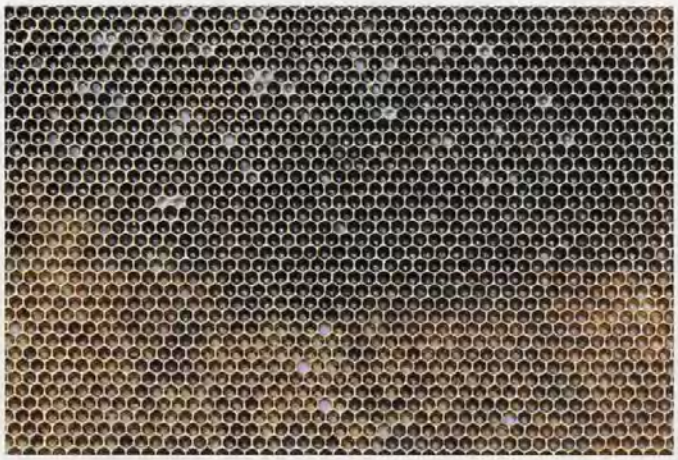
Like other beekeepers, my combs are mixed bags of yours, mine and ours. Some are only a season old, while others are probably 30-40 years old. I know, I know, those frames are too old. But some of these old frames are traditionally wired with brass eyelets and the comb is rock solid. Beekeepers don't do this kind of thing anymore, and I hate to toss the last few frames I have. *(Just so you know, I have no interest in wiring frames, but I will teach others how to do it. It still makes the best comb.)*

Having written all that story, yesterday I came across a frame that I immediately decommission even if it was a classic one. Though it has been used for years, one side is too shallow for the bees to do much. I suspect the opposing comb was built much thicker or this comb must have spent a lot of time against one of the hive walls. I will try to keep it for a while, but I know that mice and wax moths will not ignore it for long. It is jet black and has *entombed* pollen cells.

Toxic pollen

No doubt pesticide-laden pollen is a far greater issue, but there are several natural environmental toxins that affects bees. All plants do not necessarily encourage all pollinators to visit their blossoms. Even plants that do encourage honey bees do not want ***all*** their pollen to become bee brood. There are limits and I know little about those limits or how they are set and respected.

Several articles ago, I confessed that I am increasingly drawn to write about bee things about which I know little. Pollen source selection and storage is one of those subjects.



Old comb with many pollen cells sealed with propolis.

Not just the simple story that bees need pollen so they collect it, mix it with honey and store it near the brood nest. No, what I am talking about is the sophisticated interaction relationship between bees and the plants they pollinate.

If they could, bees would take every bit of the pollen from the plant's blossoms and rush back to make baby bees from it. Plants must have some way to protect their own pollination needs. Producing toxic pollens or possibly pollens that are less than nutritious are some of the methods that plants utilize. Honey bees are pollination generalists, but many pollinators only pollinate specific plant species. Those plants may or may not want honey bees to loot their blossom's larders. Over time, their pollen has become toxic to some bees and sometimes to humans.

It just gets crazier. Extra-floral nectaries may exude toxic nectar. Drought or disease can change the value of a bee-friendly plant's pollen and nectar to one that discourages bees from visiting. It would seem to me, a traditional beekeeper, pollen is a good thing for bees, and they would do anything for it. Not always. But I sense that we know and understand little about these bees that are able to discern proper food sources in the field; and if it does get into the colony, there are house bees that realize the pollen is a problem and encapsulate it with propolis and wax. How do they know to do that? Some pollen is good while some pollen is bad and sometimes, bees can tell the difference.

So when I saw the frame, I removed it

So when I saw the frame, I removed it. I don't know how often to recycle combs. Three years? Five years? Historically, I have removed frames when they otherwise began to show wear and needed repair. I have begun to date new frames so I will at least know that I am leaving it in too long.

Throughout my bee life, I have occasionally seen these closed cells on occasional frames and never thought much of it. The occurrence of these out-of-business cells is an indicator that we still have much to understand about bees and the plants they pollinate.

An emtombed pollen cell that has been opened showing orange pollen.

Normally, bees eat anything that is a problem and cannot be carried out of the hive. Indeed, even the pyloric valve in the bees' digestive system is designed to clear pollen, insect scales, and dust from sticky nectar that has just been collected. When you or I crush bees as we reassemble a hive, the only way bees have to clear that mess is to ingest it. But what if the intrusive material is poisonous. The traditional *"eat it to remove it"* procedure will result in dead or at least a sickened bee.

I wish I understood more about the bee or bees that recognized that the pollen was a problem. Did the bee(s) that brought the load in not realize they were bringing a toxic substance back to the hive? How did the house bees sense that this pollen was bad? Taste? Smell? Are they smarter than the foragers? Did the pollen change after being stored? I realize how simplistic this idea would be but would it not be great if that repellant configuration could be deciphered and then put into insecticides to offer repellency to today's pesticide products? Just daydreaming . . .

I just wanted you to know . . .

Yesterday was a productive day. Of course, today it thunder stormed, but that made this a good day to write a bee article. Yesterday, I got stung several times. When all was over, I was tired and smelled of smoke, but I saw some great colonies. No doubt, I will be writing about swarms next month. BC

Dr. James E. Tew, State Specialist, Beekeeping, The Alabama Cooperative Extension System, Auburn University; ***tewbee2@gmail.com; http://www.onetew.com; http://www.facebook.com/tewbee2; twitter@onetewbee; http://www.youtube.com/user/onetewbee.***

Top-Bar Hive Experience From A 28-Year Veteran

Wyatt **Mangum**

Figure 1. *A Colton hive patented by Aaron Colton, of Pittsfield, Vermont, On December 31, 1845.*

The article by Dewey Caron "Toward Treatment Free Beekeeping" (*Bee Culture*, May 2014) had some comments that are much different from my experience with top-bar hives. I have known Dewey for decades and respect his opinion. His articles have considerable influence, and readers could get the incorrect impression from his top-bar hive comments. First briefly, here is some background on my expertise with various beekeeping systems.

I started keeping bees at 10 years old. By high school, I had 125 frame hives, and I was producing honey by the ton. As an undergraduate in college, I sold those hives to help finance that education. In graduate school I worked a 40-hour job, and starting in 1986 I built up a 200 top-bar hive operation, concentrating mostly on commercial pollination. Back in the 1970s, I had built a top-bar hive for Homer Powers, the state Apiarist of Virginia, so I had known about that hive for a long time.

Furthermore, starting in the 1970s, I began collecting and studying historical American beehives, the oldest in my collection is documented to the 1840s (see Figure 1). My patent files have about 1,000 beehive patents. In Asia I worked with *Apis cerana* in various beekeeping systems: small frame hives, top-bar hives, and in the rarely seen wall hives in the remote parts of northern India (see Figure 2). As a result, I am very familiar with several beekeeping systems.

The top-bar hive comments in the article begin with *Treatment-free advocates often champion a different hive, such as top-bar hive.* Then comes a statement reporting that four top-bar hive books have been published in the last two years; one in the count must be mine. Next are the comments that prompted this article since my experience has been so different. *Top-bar hives are seldom opened (particularly after they are larger), frames or bees are not moved (within or between hives), and treating for mites or diseases or even feeding is not practical*.... The parenthetical that follows ... *(although some techniques have been described to treat or feed)* is essentially what I want to explain more fully. Let's focus on each of the preceding statements separately and see another perspective.

I realize some top-bar hive beekeepers could be treatment-free minimalists in managing their bees, but this group does not represent all top-bar hive beekeepers. Plenty of top-bar beekeepers actively manage their colonies. Some frame hive beekeepers in associations help provide educational support for new top-bar hive beekeepers in their clubs to help them manage their colonies. They have invited me and other experts to give day-long

Figure 2. *A wall hive. Such hives could be in a bedroom or kitchen, or other personal places in a house. Most houses did not have electricity so I used a small flashlight to examine the colonies. A smoldering cord was my smoker in the small dark rooms, the smoke blown carefully on the irritable bees, which actually hissed when disturbed.*

Figure 3. *Some of the top-bar observation hives inside the bee house that holds 30 of them.*

Figure 4. *Making up mating nucs. A pair of mating nucs goes in each nuc box divided by a central partition.*

Figure 5. *Mating nucs made on the tailgate. The tailgate of my truck is close to the height of my hive stands, saving an immense amount of back strain and making beekeeping more enjoyable.*

workshops on starting a top-bar hive (the correct way to hive a package, establishing a colony, and producing hive products). Several months later I do a second workshop, which is more advanced, and covers top-bar hive colony management. I have power point presentations with about 100 technical photographs and some videos for each workshop. (Sorry, this is not a pitch for me doing more workshops. I do as many as I can, but I have too many scheduled.)

I mention the workshops for two reasons: first to convey the amount of top-bar hive beekeeping information available for presentations and second to show the demand for reliable top-bar hive information. My information is based on 28 years of top-bar hive beekeeping experience, and I test new equipment and techniques in my bee house (see Figure 3).

The next comment is *frames or bees are not moved (within or between hives)....* First a confusing word correction that occurs sometimes when frame-hive beekeepers talk (or here write) about top-bar hives. As we know, a frame is a wooden rim surrounding the comb. In a top-bar hive, the comb hangs from the top bar without the surrounding rim. A more accurate term for this arrangement is a *top-bar comb.*

In my seasonal top-bar colony management, I routinely move brood and honey combs within and between colonies to equalize them. In the Spring, first I strengthen the weak colonies with brood from the stronger colonies. Then I make splits, sometimes up to about 80. In some years I make numerous mating nucs too (see Figures 4 and 5). I also move honey and brood combs within a hive. All of these manipulations, I consider routine management. In my book *Top-Bar hive Beekeeping: Wisdom and Pleasure Combined*, the chapter on managing top-bar colonies is the longest and most extensive chapter, about 100 pages with 100 photographs. I wrote the management chapter with plenty of detail since so little has been written on this subject.

The next statement is *treating for mites or diseases... is not practical.* First let's be clear; currently I do not treat for *Varroa* (or tracheal mites). I have not treated for *Varroa* for about 10 years, and I do not use any other methods to reduce the *Varroa* populations (drone brood removal, screen floors, etc. Usually my Winter losses are low. For this past Winter it was 4%, which I consider unusually low (not typical). My bees "acquired" *Varroa* Sensitive Hygiene (VSH) on their own (I did not buy stock with that trait). I know my bees have VSH because I showed the presence of the trait by conducting well-designed scientific experiments that called for much mite counting to collect the data. To help VSH stock maintenance and local adaptation, I keep my queen mating yards in swamps where the uncontrolled "background" drones originating from feral survivor colonies "add" to drones from my drone-mother colonies.

While I knew top-bar hive beekeeping before tracheal or *Varroa* mites, I had to adapt or my bees would have died and I would have lost my pollination contracts. To get treatment protocols to accommodate the top-bar hive design, back in the 1980s, I figured the most logical

Figure 6. *A multiple comb observation hive in my bee house left over from Winter studies. Note the feeder jar.*

Figure 7. *The bees are working the feeder jar, a unique view.*

Figure 8. *The placement of my feeder made from a trashcan. As the colony grows, you move the feeder back a little, keeping it in contact with the cluster, but not letting the bees build comb in the feeder.*

solutions using frame-hive data and methods as a starting benchmark. In 1984, tracheal mites entered the U.S., and varroa mites arrived in 1987. Tracheal mites killed my top-bar colonies in North Carolina. The approved treatment was 50 grams of menthol crystals in a screen pack. I made my own screen packs from window screen, loaded them with menthol, and placed the packs at the back of the hive (opposite the entrance end). As with menthol-treated frame-hive colonies, top-bar colony deaths decreased greatly. I also used grease patties. These treatments were easy to install and they worked. Apparently the tracheal mite susceptible stocks died out and long ago I stopped these treatments simply because they were not needed. But they were easy to apply and they were effective.

Even with 200 top-bar colonies scattered out on 15 farming locations in five counties pollinating cucumbers and other crops, I treated them with Apistan® for *Varroa*, so efficiently and so quickly I did not even need to open a hive. With my hive tool, I just separated a pair of adjacent top-bars, just enough to slip in a strip between them, and then push the top bars back together again. (For logistical details and pictures see the book.)

Assuming the last part of the statement ... *or even feeding is not practica*l, refers to sugar syrup feeding, the comment probably stems from using inverted jars, which are commonly touted as top-bar hive feeders. In my opinion these are inefficient feeders, but there are better ones.

In my top-bar bee house, here is a comparison of the jar feeder and an internal feeder that I have began using since 1986. Figure 6 shows a multiple comb top bar hive used to study a Winter cluster. Notice the jar feeder, situated quite close to the cluster, much closer than some jar feeders I have seen in other top-bar hives. The jar rests on a panel of eight-mesh wire (sturdy wire used for screen floors). With the glass sidewall removed, we can look at the jar top from the inside of the hive to observe the bees feeding on the syrup through the feeder holes (see Figure 7). About 30 bees are filling up on syrup, which is typical on a warm May afternoon. For a newly installed three-pound bee package, this number of bees is way too low in my opinion. The new colony requires a much higher rate of syrup intake to support the massive amount of comb production.

In contrast, consider a high capacity feeder close to the cluster, inexpensive and easy to make. Here is an internal feeder made from a small plastic trashcan that holds about two gallons of syrup. I can feed a package colony or an established colony with it. For a package colony, briefly, the feeder touches the back edge of the cluster (see Figure 8), giving the bees a short walk from the cluster to the syrup level. Many hundreds

Figure 9. *The bees crowding into the feeder. Here I used comb for floats to help keep the bees from drowning. When you see how fast the bees can take this much syrup, particularly when starting the package, the jar method becomes inadequate.*

Figure 10. *Plug on feeders in two sizes. My book tells how to build and use them.*

of bees can feed at one time without the bottleneck seen at the jar holes (see Figure 9). I also have external feeders that plug onto the upper middle entrance hole for feeding strong colonies in hot weather, for example in the Fall preparing them for Winter (see Figure 10). This "plug on" feeder is a very efficient feeder. To use it, you only handle the feeder twice: at installation and at removal. It is not like a jar feeder that must be handled at every refilling, a real pain when feeding 100 hives. With my "plug on" feeder the hive stays closed when filling the feeder, saving more time and labor.

The statement *The hive encourages less intervention* is not easy to assess since the meaning of intervention is not clear at that point in the article. Later in the article is the term *treatment intervention.* If that is the meaning, then as described above, treatments in top-bar hives are easy to apply.

On a final point, I *routinely* open top-bar hives so quickly and quietly that the bees are hardly disturbed (see Figure 11). There is no cover to pop off, no supers to crack off, vibrating the entire hive, which to the bees inside is very disruptive. The top-bar combs are easy to handle once you know how, which is just a matter of training.

In closing, for me, a veteran frame hive beekeeper, switching to top-bar hives a long time ago, I wanted to take the best of frame-hive beekeeping and use it build another beekeeping system for top-bar hives, complete from honey production to specialized operations like package bee production, which I did. But in the end, I became completely divorced from frame-hive *thinking* and vertical bee management, and fully embraced horizontal bee management – new thinking – with top-bar hives. Bringing top-bar colony management out as a subject that needs to be learned and taught like frame-hive colony management would help the top-bar folks and hopefully provide some comfort to frame-hive beekeepers as well. Dewey has been a long time apicultural instructor, and he has top-bar hive experience. Educators like Dewey and me can bridge both beekeeping systems and help beekeepers appreciate the others' systems. (For pictures of my top-bar apiaries, see the links at the top of the page at **TBHSbyWAM.com**.) BC

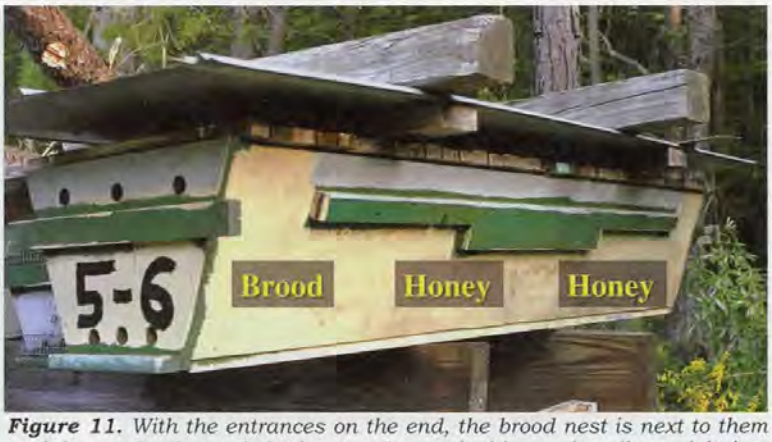


Figure 11. *With the entrances on the end, the brood nest is next to them and the surplus honey is in the rear. I open the hive and easily go right into the brood nest even in the main nectar flow when frame hives are stacked with supers. Even at five feet long, and maxing out at about 240 pounds, this is a mobile hive. I just back the truck to the hive and slide it on the truck, about as easy as such a heavy job can get, and just me working in the dark.*

Acknowledgments

The author thanks Suzanne Sumner for her comments on the manuscript.

BEESWAX

THE FIX IT'S IN, AND A WAY TO FIX IT, PART 2

M.E.A. **McNeil** & Maryann **Frazier**

Beeswax: a wondrous substance exuded from the bodies of bees to create a home complete with nursery, pharmacy, storeroom and vibrating communications center – prized and revered by humans since prehistoric times for light, protection and spiritual connection.

It comes dear to the bees. A strong nectar flow is needed to feed the young wax-exuding workers, and the cost to create a pound of beeswax is well over five pounds of honey – even double or triple that (Brown 1995, Whitcomb 1946, Coggshall and Morse 1984, Buchmann, unpubl). But what a marvel: That pound of wax, made into comb, can hold 22 pounds of stores (Brown 1995).

Pure beeswax is edible, pronounced safe for human consumption by the USDA, since it passes through the system unaltered. That makes it an ideal ingredient for medical preparations and cosmetics if it is pure. But, mostly, it is not pure. How impure it is was "mind-blowing" to Maryann Frazier, Chris Mullin and Jim Frazier, colleagues at Penn State University. They coordinated with Roger Simonds of the USDA Gastonia lab to screen hive samples for 171 pesticides and metabolites, breakdown products. They found chemicals pervasive (M. Frazier 2014).

"The wax is contaminated with pesticides. Pollen, the protein source fed to larvae, is also contaminated with pesticides. What bees are eating and what they are living in is contaminated; the hive is a toxic house," said Frazier (McNeil 2011). In the first 887 samples, 99% had detectable residues; they found 121 of the pesticides in the screen, some of which had not been registered for many years. Most often, and at the highest levels, were acaracides put into hives by beekeepers to control mites over nearly three decades (Mullin, 2010).

It turns out that honey bees are excellent biological indicators of the chemicals in their environment, and hive wax stores a record of chemical exposure that occurs both inside and outside their hives. Because most pesticides are lipophilic (attracted to/dissolving in lipids), they are absorbed in wax, a lipid. The Penn State study proved it to be an efficient sink: almost all beeswax samples (98%) were contaminated with pesticides, most commonly fluvalinate, coumaphos, amitraz degradates and chlorothalonil, a widely-used fungicide. Nearly 60% of the wax samples contained at least one systemic pesticide. Some pesticides in combination synergize to become more toxic or "swamp" the detoxification mechanisms of bees – for one common example, coumaphos combined with fluvalinate. Synergism is common with certain classes of fungicides and these miticides (Johnson 2009, Mullin et al 2010).

The detectives' detective – Roger Simonds at the National Science Laboratory, USDA Agricultural Marketing Service, worked out a protocol with the Penn State team for testing hive products for pesticide to parts per billion. He is pictured with a GC/MS/MS, gas chromatography-mass spectrometry machine, used to identify different substances within a test sample. (photo courtesy of Roger Simonds)

It matters a lot for the bees and their keepers. "Laboratory studies have clearly indicated sublethal impacts [of some pesticides] on honey bee learning, immune system functioning, and synergism of insecticide toxicity by fungicides," according to Mullin (Raloff 2010). Other research has indicated that pesticide residue in brood comb reduces adult longevity, enhances the reproduction of Varroa because of delayed emergence of adult bees, and increases susceptibility to pathogens (Wu, 2011).

Finding Clean Foundation

Wax is the least renewable resource in the hive. Research labs have found that obtaining pure beeswax for comparative study has been an unexpected challenge. For example, in Part I of this article, University of Georgia researcher Jennifer Berry was left hunting for clean foundation to use as a control to examine the effect of miticides on bee health.

Roger Simonds is the go-to guy for chemical analysis of wax. His lab at the USDA-AMS-National Science Laboratory, using the analytical method developed with Mullin, can screen for commonly used pesticides and their metabolites to parts per billion (ppb). He detected chemical contamination in Jennifer Berry's samples from commercial sources, acaracide-free Brazil and even hives of her chemical-free beekeeping friends (Berry 2009).

The same problem faces beekeepers across the country. A variety of foundation samples analyzed by the Penn State researchers, via the USDA-AMS-National Science Laboratory, found all to be miticide contaminated with levels of coumaphos as high as 12.9 ppm and fluvalinate as high as 10.1 ppm. Wax removed from wax-coated plastic foundation had a coumaphos level of 6.3 ppm and fluvalinate level of 2.7 ppm and all foundation samples had additional pesticides at lower levels.

What to do about it? The answers seem to be: Find clean wax, clean up what we have or don't contaminate it in the first place. No simple choice. Here follows an attempt to sort out the unwieldy, impractical, crazy-making and just plain dangerous from some possible answers.

Hawley Honey hand crank embosser is made with technology developed by Tom Lazarevich. (photo courtesy Hawley Honey Co.

An informative brochure from Tom's Industries. Tom Lazarevich became expert in mill design, and his work was acquired by Hawley Honey after his death. (photo courtesy of Hawley Honey)

Find Clean Wax

The first place a beekeeper is inclined to look for clean wax is in untreated hives. It's not so easy. Pesticide residues quickly diffuse through wax or across comb surfaces in an active colony, as shown at the end of an experiment by researcher Judy Wu Smart at the University of Minnesota. She sent Simonds samples of comb used as an uncontaminated control; they were shown to have absorbed chemical residues over a three month period. Also, high levels of metabolites were detected, suggesting the possible metabolism of active compounds as the result of pesticide migration. Whether it came from contaminated bees or flowers, it was readily tracked through the frames (Wu 2014). Even after decades without hive treatments, Vermont beekeeper Kirk Webster said he was shocked when a lingering residue of coumaphos, which he used at a low dose once, many years ago, was detected.

Jennifer Berry gave up her quest to buy clean wax and used strips of plastic foundation along the frames, adding wire guides to allow the bees to build their own comb. It was a solution to the problem, but some crooked and joined comb made it an unwieldy one for her study (Berry 2013). Beekeepers who prefer to allow the bees to build their own comb, such as in top bar hives, can alternatively use melted wax or strips of beeswax as starting guides (Krell 1996). Penn State researchers use a technique adopted by a number of beekeepers: plastic foundation coated with wax analyzed and identified to be free of pesticides, or cappings wax in the case of beekeepers.

Cycling out old comb, where pesticide residues persist, is a widely recommended management technique for cleaning up toxicity in the hive (Berry and Delaplane 2001). But Wu's research shows that new comb, with weaker pheromones, is less attractive to nurse bees, negatively impacting the care of brood reared in it. So it's a tradeoff, with the balance in favor of housecleaning.

Foundation Molds

Foundation, a hexagon-embossed sheet of beeswax, provides a base or mid-rib in frames to guide cell construction into straight, movable combs for the beekeeper to work. Wax foundation is one of the few products not supplanted by synthetic waxes, which bees will not accept (Shimanuki 2007). Although plastic foundation and even frames are now ubiquitous, a study at Cornell University indicated that bees have a preference for drawing out beeswax foundation over plastic (Seeley 2006). Beekeepers have long deferred its difficult production to manufacturers, but, out of concern for contamination, the lost craft of small-scale foundation making has been revived.

The least expensive means for making foundation, although not necessarily the best, is with a mold. It can be made of plaster impressed with foundation patterns.[1] Silicone can provide a flexible impression; it is poured over a sheet of plastic or wax foundation fixed into a frame and allowed to set into a pliable sheet. The opposite side of the master is used to make the second part of the mold, which is then hinged to the first to align front and back – a tricky maneuver to make precise. A lightly soapy mold release is used before liquid wax is then poured into the mold to form a sheet of foundation.[2] Such molds are not replications but slightly smaller and more shallow than the originals, producing foundation that is yet another generation smaller than the molds. Foundation from molds is more brittle than milled foundation.

Milling Foundation

A foundation embossing mill is expensive, and using one requires some skill. That being said, it is being done by a growing number of beekeepers. It is an exacting process, as the two sides of the foundation sheet must match perfectly: the bottom of one cell precisely faces three opposite cells (Shimanuki 2007). A method called dip and roll is most often used for small-scale production, with control of foundation thickness acquired with practice. A workroom needs to be warm enough for wax to be malleable, about 70°-75°F (21°-24°C). A non-reactive container of melted wax needs to be heat controlled so that liquid wax will not run off dipping boards or adhere unevenly (Coggshall & Morse 1984).

"Learning to make foundation was the most difficult thing I ever did with bees," said Kirk Webster, who now makes 2000-3000 sheets of foundation with a hand cranked mill in the off-season. He concluded that the reason the bees were ignoring his foundation was that

Foundation is first poured into long molds and then fed into a mill at the Rare Hawaiian Honey Company. It is then cut to shape for inserting into frames. The company leases enough wild land to become certified organic, and their wax tested pesticide free by the USDA. (photo courtesy of Michael Domeier)

his machine was poorly made, so he replaced it with a well-crafted mill from Mennonite beekeeper Myron Kroeps, who offered helpful direction. "The difficult thing is getting the right temperatures", he said. "But it's not that complicated, once I got it figured out" (2014 personal communication).

He dips pieces of lauan plywood (also called meranti or Philippine mahogany) into a vertical vat of wax, keeping the wood cooler than the wax between dips by submerging in water. The number of dips in the hot wax determines the thickness of the wax sheets to be fed through the mill.

He produces about 400 sheets a day. He fastens the foundation into frames with two wires and two vertical sticks, after C.C. Miller. He does see more drone brood – an observation made by others with mills from different sources – but not enough to be detrimental.

He figures his expenses to be $.05-.07 per sheet – mostly for electricity to heat the vats and the workroom.

Don Kuchenmeister demonstrates foundation making with a video in which he says "Anyone can do it."[3] He keeps wax at about 172°F (78°C) in a commercial rectangular turkey roaster with a temperature gauge and a cooling water bath at 91-95°F (33°-35°C). Other beekeepers, like Robert MacKimmey and Volker Ackerman of Marin and San Francisco, make the wood dippers 1-2" larger than final size in order to trim edges and square the foundation. They dip the wood horizontally, finding it takes some practice, peel the wax off and re-dip it in warm water to soften before it is fed into their mill. They make it a two-person job, with one feeding in the sheet and cranking and the other pulling the sheet gently out of the rollers. "It's like making pasta," MacKimmey said.

Long wax sheets are prepared at the Rare Hawaiian Honey Company. They are fed into the foundation mill and loosely rolled until they are cut to shape. Deciding to move on from small cell foundation, which did not prove to be a *Varroa* preventative, owner Michael Domeier took a chance on buying a 5.1mm mill directly from China and reports that the bees build well on the foundation. The company, certified organic, leases 1000 undeveloped acres of state land where no pesticides are used. State apiarist Danielle Downey had the wax tested by the USDA, and it came back clean.[4]

Buying a Foundation Mill

Machines successfully cranking out foundation can have an arcane origin, with some from a hand craftsman who only occasionally makes one, and others from a long closed company. What is available now is not easily compared.

Hawley Honey, a company in the foundation machine business since 1942, is the only remaining domestic mill maker. Hawley had been buying embossing rollers from Rietsche in Germany, still a major foundation machine manufacturer. A company in Arizona, Tom's Industries, had perfected rollers over many years, so the acquisition of that company made it possible for the Hawley family to make complete machines (Moore 2014).

Erik Österlund, editor of the Swedish beekeeping journal "Bitidningen" has one of these machines and wrote: "Today Hawley Honey has some quite good mills from the design of Tom Lazarevic. There are some parts of a mill that are worth considering, the cell size, the cell walls and the cell bottoms. The most important part for getting foundation that the bees like and draw well is the angles in the cell bottom . . . a deep cell bottom as similar as possible to natural cell bottoms. But the manufacturers of mills and molds make a compromise here as the deeper the angles are, the more difficult it is to release the foundation . . . [so they make] mills with somewhat flatter cell bottoms. The Lazarevic type I would consider one of the best. If you consider buying ask for the Lazarevic type."[5]

At Hawley, a family business, it takes Robert Moore two to three weeks to build a small machine. It is off-season work, since he also keeps about 1500 colonies and delivers honey to over 100 stores. He makes large commercial machines, and three kinds of small-scale models that can be either hand cranked or machine driven. His father-in-law Raymond Cooper points out that they use heavy-duty bearings, and the mechanism for all the models is of the same quality.[6] They also make pre-rollers, called sheeters, for beekeepers who prefer not to use the dip method of preparing sheets for embossing.

Other sources: The hand-made mill by Myron Kropf in Arkansas has "good deep bottom angles", according to Österlund, however he produces very few. A mill from Mann Lake, manufactured in China, will be used by

A snowy Vermont day in a room warmed up for wax foundation making. As Kirk Webster cranks the mill, he pulls the embossed foundation sheet with a wood and plastic grip that is attached to a clamp. (photo by Dean Stiglitz)

Kirk Webster makes 2-3,000 sheets of foundation every year with his hand-cranked mill. The tube above feeds water into a homemade cylinder that drips onto the rollers, keeping them cool. (photo by Dean Stiglitz)

Karen Cosgrove at Cosnic Honey with the support of a sustainability grant from Kentucky State University.[7] A Chinese mill was bought direct by Rare Hawaiian Honey; several Chinese companies sell them through the website Abracadabra. Rietsche machines, made in Germany, are called by Weber "the Mercedes-Benz of mills".

A Cooperative Model

A beekeeping center, complete with a foundation-making facility, has been built by The Gorenska Beekeepers in the Slovenian city of Lesce.[8] Such foundation cooperatives were once common in the country. Beekeepers can have their wax processed there for €1.20 ($1.67) per kilo, which produces about 74 sheets of foundation. Small-scale beekeepers can pool wax to make the minimum 20 kg (about 45 pounds).

Importing Wax from Abroad

There is more demand for beeswax in the U.S. than can be satisfied domestically, as is the case for most industrial nations. A developing country producing certifiable uncontaminated wax would have a valuable export commodity, but such logistics have proven complex.

The acaricides prevalent in U.S. wax are not found in Australia because *Varroa* is not there. Foundation sheets ordered by California beekeeper Jerry Draper from the bee supply company John L. Guilfoyle, Ltd., outside of Brisbane, were found to contain one pesticide, the organophosphate insecticide chlorpyrifos, at 165ppb. The acute contact LD50 for honey bees is 762ppb. While 165 ppb is below the acute LD50, if bees were exposed to this level of chlorpyrifos in their wax combs we would expect to see some toxic effect due to the bioaccumulation that would occur over time.

Burt's Bees spokesperson says that the company sources wax from East Africa, but cannot specify the location or produce testing information.

A project in Kenya, with researchers from Penn State University (including author Frazier) and Nairobi-based *icipe* (International Center of Insect Physiology and Ecology), surveyed the major ecosystems for beehive numbers, parasites, pathogens and pesticides (Muli 2014). Kenya does not have migratory beekeepers, package producers or queen breeders. The honey bees, four subspecies of *Apis mellifera*, migrate with the seasons, and beekeepers put out bait hives in advance of the rainy season to hive them. The research team discovered *Varroa* there in 2009, and they have discouraged the use of acaracides (McNeil, 2011). Some agricultural chemicals were found in the wax, although mostly at low levels. A few locations were more toxic, such as one along the coast with nine residues, three of which, carbaryl, lindane and permethrin, are considered highly toxic to bees. The most wide-spread pesticide was the fungicide chlorothalonil. New samples from a subsequent recent trip are being analyzed with a goal of finding uncontaminated exportable wax to support a project designed to trade U.S. sponsored solar wax melters for clean wax.

Clean Up the Wax We Have

Many acaricides cannot be removed by rendering (Shimanuki 2007), washing or steaming, as is the case with other pesticides. Gamma irradiation had minimal results on lower pesticide levels at Penn State. Ozone was proposed in the early 40's at the USDA for decontaminating beeswax from American foul brood (K. Flottum, personal communication). Two new USDA studies have demonstrated that ozone gas fumigation can remove both pathogens and pesticides from beeswax comb (R. James 2011, 2013).

Ozone is an oxygen molecule with three oxygen atoms instead of two. Because it is unstable, it is a highly reactive, a strong oxidizer that breaks down into water and 0_2.[9] Ozone, a substance "generally recognized as safe" by the U.S. Food and Drug Administration, is used to decontaminate water, fruits and vegetables.

The studies, led by entomologist Rosalind James, were done in two parts at the ARS Pollinating Insect Research Unit in Logan, Utah. The first, published in 2011, demonstrated the efficacy of ozone at killing all life stages of the greater wax moth (at concentrations

BUYING FOUNDATION MILLS

Alibaba
Direct from China. Various manufacturers, specifications. Most plus shipping. **alibaba.com**

Dixie Bee Supply, Lula GA
Plastic rollers $1300, metal $2000 plus shipping. Unspecified origin. Don Kuchenmeister, Lula, GA, 706.677.3502, **beekeeper4u2@wmconnect.com**

Glory Bee, Eugene, OR
Metal rollers, non-adjustable, 4.9mm cell size, made in China. Comes with directions. $1500, plus shipping, 139 pounds. **http://www.glorybee.com/shop/Beeswax-Foundation-Mill.html**

Hawley Honey Company, Iola, KS
U.S. manufacturer, small to commercial, manual or machine driven, non-adjustable or adjustable, plastic or zinc plated rollers, 2 ½ inch or 3 ½ inch diameter, all with metal bearings, cell sizes 4.1, 4.9, 5.1 and 5.3mm. $800 to $2400 plus shipping, specific quotes made by phone. 620.360.5956.

Mann Lake, Hackensack, MN
Manually operated, two separate machines with aluminum rollers for sheeting and embossing, made in China, cell sizes 5.1mm or 4.9mm. $2,565, shipping included. **www.mannlakeltd.com**

Rietsche, Germany
Manufacturer, steel cylinders jacketed with embossed alloy, ball bearings, direct drive, comes with attached solvent sprinkler, cell size 5.4mm or special order (eg 4.8, 5.2, 5.6), manual from $4,600 to $6,400, motor driven from $6,750, prices dependent on roller length, plus tax and shipping. Extra cell depth for surcharge. Mills can be purchased prepared for a motor drive to be added later. **www.rietsche.de.**

of 215-430ppm, with eggs requiring longer exposure), chalkbrood fungus (at 1,500ppm for 24-36 hours), and American foulbrood (requiring doubling ozone concentration, high humidity and longer exposure). AFB bacterial spores are very resistant to chemical disinfectants and heat.[10]

The second part of the study, published in 2013, describes ozone breakdown of coumaphos, fluvalinate, and other pesticides that accumulate in beeswax. Lab experiments with ozone fumigation degraded 93-100% of coumaphos and 75-98% of fluvalinate (at 500ppm for 10-20 hours). Higher concentrations and longer exposure were required to reduce those acaracides as well as eight other common agricultural pesticides from samples of commercial comb -- including the insecticides esfenvalerate, (Conquer, Ortho Bug B Gon) and thymol, as well as the fungicide chlorothalonil (Fungonil, Daconil). Ozone significantly reduced dimethylphenyl formamide, chlorpyrifos, and fenpyroximate contaminations in comb.

Ozone treatments degraded pesticides considerably better in comb less than three years old than in comb more than 10 years old, leading the researchers to advise rotating aging comb out of the hive. "There's something about the wax that can impede this breakdown, especially in a comb that's been reused in hives for many years," says James.[11] She envisions beekeepers fumigating combs before they are placed in storage for the off season, possibly starting with new comb and treating it yearly to prevent pesticide residues from building up.

"Irradiation has to be done in a regulated facility," said James, "Whereas an ozone fumigation chamber is something beekeepers can set up on their own using commercially available equipment."

Beekeepers Elmer and Martin James conducted a field study for the USDA lab at their Slide Ridge Honey in Mendon, Utah. On the 8880 frames processed, nearly all pesticide residue was destroyed, herbicide residue destroyed, and wax moth destroyed. "Comb with severe wax moth damage has never been acceptable to our honey bees . . . but ozone treated, is very acceptable; the bees moved right onto it and started cleaning out the cells for reuse," said Elmer James. In the trial, success came with longer and stronger treatment than at the lab: nearly 100% of chalkbrood was killed in two days (1500ppm, 25°C [77°F]) and all American foulbrood spores in three days (4000 ppm, 50°C [122°F], 90% humidity).[12]

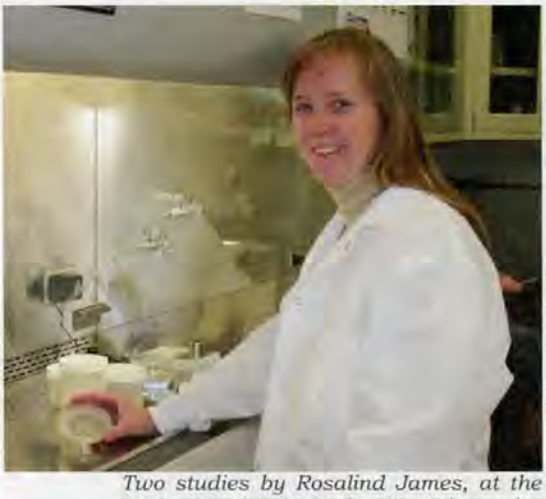
Even with these results, the James' are not ready to use ozone treatment again. An airtight chamber is required for ozone fumigation, as it is toxic to animals (humans included) at the concentrations used to kill pathogens and degrade pesticides – although it breaks down rapidly and harmlessly into oxygen and water. It is not safe for latex or rubber, and ozone leakage into the James' adjoining warehouse room damaged a stack of tires.

"The reason we tried ozone," said Elmer James, "Was because of used equipment we purchased from many different commercial beekeepers that had gone out of business, for reasons unknown...We were having dead-outs in a number of the brood boxes, the bees did not take to them; after O_3 treatment the bees were very content in these brood boxes – if O_3 treatment would salvage the equipment it was worth the expense." He observes that further research needs to be done on the amount of degradation of wax per amount of ozone applied.

The leased generator was $3000 per month and electricity $95 for the field study – making the cost per frame $.36, without counting the substantial labor. "If we were to use ozone again, we would use a freight container set far away from all other buildings. It appears that it would take the scale of large commercial beekeeping to offset the cost, or an agricultural co-op . . ." he said.[13]

That vision has come about: The Ontario Beekeepers' Association Tech Team and Parker Bee Apiaries have collaborated with the University of Guelph for an ozone honey comb decontamination pilot project, supported by a Canadian Federal Department of Agriculture grant.[14]

Mike Parker, a commercial beekeeper with 6,500 colonies, has seen his share of loss. Several years ago, he lost 90% of his stock.[15] He invested in the ozone project with an interest in reusing as much comb as possible, so most of the comb in the current experiment is older than three years, according to Tech Team member Devan Rawn.[16]



Two studies by Rosalind James, at the USDA-ARS lab in Utah, showed promise for the use of ozone treatment to rid beeswax comb of pathogens and pesticides. (photo courtesy Rosalind James)

They have contracted with Simpson Environmental Corporation, which specializes in ozone treatment for air and water, to design and install the mechanism. A retired refrigeration trailer, which can service multiple locations, was a quarter of the cost of insulating a freight container because it is already insulated with ozone-resistant claddings; also, it is considerably longer, making it possible to treat nine stacked pallets.[17] An equipment room at the front end with its own door, separate from the decontamination chamber, contains a Simpson-designed ozone generator, oxygen concentrators, and ozone destruction system. Controls raise the treatment chamber temperature to 40°C (104°F) and 60% humidity before injecting high concentration ozone into the air stream. Ozone resistant tubes are inserted into the combs at various levels to monitor the ozone levels up to and beyond 1000 ppm. The reefer has the capacity to treat about 800 combs per load, with dosages and durations to be determined by the results of the pilot. Test results are forthcoming from a lab at Guelph University for acaricides and three neonicotinoids, according to Rawn.

James Simpson describes the design as "revolutionary", and the company is in the process of patenting it.

There remains one more way to address the problem of miticide-contaminated beeswax – not putting pesticides into it to begin with. This will require effective alternatives to address the *Varroa* problem, not an easy mission. Nevertheless, management of hive pathogens and regulation of pesticides are under intense review by beekeepers with a goal of cleaning house for the bees. BC

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Got A Question?

Ask Phil

Phil **Craft**

He Knows!

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

A beekeeper in Michigan writes:

I have some used equipment that was totally overrun by wax moths. The combs were destroyed and there were masses of webbing, cocoons and live larva still present. After cleaning the equipment the best I could (there were still larvae in every crack and cranny) and burning the refuse I sprayed everything with a solution containing "Thuricide" (Bacillus Thuringiensis). My initial thought was it would be a good nontoxic biological control. NOW in retrospect, I am concerned it could also destroy any future honey bee larva that would occupy this equipment in the future??

My question is, have I created a problem? Can this inoculated equipment ever be used by bees and brood again? Does the bacillus have a lifespan?

It seemed like a good idea at the time, now I am very apprehensive. Can you please help?

Phil replies:

I think you may rest assured that the Thuricide will not harm your honey bees when you re-use the equipment.

Thuricide is a subspecies of the bacteria Bacillus thuringiensis, most often referred to as Bt. Bt is a bacterium, discovered in the early 20th century, and now widely used to control the larvae of several horticultural pests such as gypsy moths, bagworms, mosquitoes and others. There are a number of subspecies of Bt, each effective at killing a different, specific insect species. Thuricide is a subspecies named kurstaki, and is effective only on leaf and needle sucking insects. Wrong subspecies for wax moths -also for bees. At one time, a different subspecies of Bt, Bacillus thuringiensis aizawai, was registered and labeled in the United States to control wax moths and was sold under the product name of Certan®. It is no longer registered or manufactured for sale in the U.S., though it is still available in Europe. The Mid-Atlantic Apicultural Research and Extension Consortium, has a nice handout on wax moths which discusses Bt, including Thuricide and Certan®. You can find it at: **https://agdev.anr.udel.edu/maarec/wp-content/uploads/2010/03/Wax_Moth_pm.pdf.**

Wax moth damage. (photo courtesy of Univ. MN Bee Lab)

While Thuricide will not harm your bees, it is not registered for use on honey bees or beekeeping equipment, and beekeepers should not use non-registered products in their hives. We always need to remember that we are producing a food product – honey – which is the reason that the pesticides and medications we use are regulated. Even though we may consider a given product non-toxic and therefore safe to use around our bees, we must keep in mind the image of honey as a safe, natural product. Many beekeepers are concerned (and many are appalled) by the products which we can legally put in our hives these days. My philosophy has always been to use the minimum chemicals necessary to control varroa mites and disease, and to use ONLY those registered for use with honey bees.

In my own hives, I am quick to discard and destroy any comb which may be diseased in order to reduce the need for chemical treatments. In the case of wax moths, no chemicals are necessary - not even a cleaning product. After disposing of the damaged comb, as you did, I simply scrape the boxes and frames well with a hive tool and they are ready to store or re-use. Beekeepers who use plastic foundation often scrape it clean and re-use the frames immediately. Bees today do face existing threats which can require chemical interventions, but wax moths are not among them. The only defense you need against wax moths is a strong, healthy hive.

A beekeeper in North Carolina writes:

Hello! Certainly enjoy your column in Bee Culture.

So here is my question. Can bees and chickens live together? My thought is put a fence around the four hives in my apiary. Let the hens loose and they can keep the grass

mowed. Can't find anyone or anywhere that this is happening. Can you comment?

Phil replies:

Not a good idea. When advising beekeepers on apiary locations, I always caution against placing hives near confined animals – especially small animals. Even bees that are not overly defensive may respond badly to the presence of animals (or people) within a short distance of their colony site. During my tenure as Kentucky State Apiarist, I looked into several reports of dogs or chickens stung to death by honey bees. In every case, the animals were either tied close to hives or confined inside a small, fenced yard nearby. When the bees started stinging, the animals had no way out.

My old dog loved to go with me everywhere, including to the beeyard. After a few lessons (administered, not by me, but by the bees), she learned not to approach the hives too closely. She could lie in the shade a short distance away, and the bees would generally ignore her. However, on occasion, I would look around and find that she was gazing at me dolefully from the front porch of the house, once again chased from her best friend by those pesky insects. As long as the animal in question has an escape route, it can run away and the bees will only follow for a short distance. Animals confined in a small backyard with beehives are in danger; those in a two acre yard are usually fine. I once had a call from a beekeeper whose $500 fighting rooster was killed by a colony of bees. The hive was sitting within 10 feet of the small enclosure containing the rooster. The beekeeper was not happy.

The same caution applies to large animals as well, though they are less vulnerable. I once set up an apiary on a friend's farm, not knowing that he had horses confined in a small pasture on the other side of the fence. I never had a problem, but it made me nervous, and I ended up moving the hives. Beekeepers and animal owners in areas where Africanized bees are found need to be especially cautious. Africanized honey bees defend a larger radius around their hives than European honey bees, respond in greater numbers, and inflict more stings. There have been multiple instances of horses killed by Africanized bees in the U.S. I also recall a goat which died several years ago in Virginia after being stung by bees which were subsequently identified as Africanized.

My advice is to buy a weed eater.

A beekeeper in Missouri writes:

I attended the EMBA [Eastern Missouri Beekeepers Association] beekeeping school in February. I meant to ask you about the deep boxes. Do you always leave the honey in these alone? Not sure which boxes I actually take the honey from and how to manage the hive all together, with regard to when and what to do with honey in the boxes? May I harvest honey from the deep boxes? Thanks for your time. Enjoyed hearing you speak.

Phil replies:

It can be difficult for new beekeepers to make sense of hive management advice when we identify the components of a hive in so many different ways. We call them hive bodies, boxes, brood boxes, bottom boxes, brood chambers, honey supers, or just supers. We also refer to them by the height of the box: deeps (about 9.5"), mediums, also called Illinois (about 6.5"), and shallows (about 5.5"). Not to mention nucs. No wonder there is confusion.

Here are the basics. A conventional Langstroth hive is made up of one or more boxes containing frames. Many beekeepers refer to the boxes, collectively, as hive bodies. It is also technically correct to call all of them supers, and some beekeepers and beekeeping books reference them in this manner. Most, however (myself included), use super as shorthand for honey super. The most useful way to discuss hive components is in terms of function, without regard to size. We have boxes for brood and boxes for honey. Brood boxes, be they deeps, mediums or shallows, are located directly over the bottom board, usually remain on the hive all year, and are where the queen lives and lays her eggs. This is where the colony rears new bees (brood) and stores food (pollen and honey), with which to sustain itself. Honey supers are extra boxes which beekeepers add above the brood boxes, often separated by a queen excluder. (See my June 2014 column for a question/answer about the use of queen excluders.) This is where bees store surplus honey during periods of abundant plant flowering, or nectar flow.

Commercial beekeepers typically prefer the efficiency of using deep hive bodies for both brood and honey – fewer boxes to purchase and fewer frames of foundation to install. The most common hive configuration among small scale beekeepers is two deeps for brood boxes, and for honey, as many shallows as the bees can draw out and fill. That is why you'll often hear "deep" used as synonymous with brood box and "shallow" for honey super, but that is misleading with so many other combinations possible. In the South and upper South, where winters are mild and colonies need fewer bees and food stores to survive them, brood chambers consisting of a single deep and one shallow, are popular. Many beekeepers opt for using several shallows or mediums - no deeps at all - as brood boxes, in order to limit weight, since a deep brood box full of honey (as the top brood box may be at certain times of year) can weigh close to 100 pounds. Some also like the simplicity of using only one size of hive body for both brood and honey. Still others prefer to use mediums, rather than shallows, as honey supers. With few exceptions, I use deeps exclusively as brood boxes and shallows for honey. One reason I prefer this arrangement is that I do sometimes treat to control *Varroa* mites or disease using products which cannot be employed with honey supers

on the hive. By using size to differentiate function, I avoid having to keep track of which frames have been exposed to chemicals and which are available for honey. Beekeepers who use the same size box for both functions, and who also occasionally treat, need some method (such as marking frames or painting the boxes different colors) of keeping them separate.

As to your question about harvesting honey from deep boxes: if by "deep boxes" you mean brood boxes, I usually recommend against it. I, personally, consider all the honey in the brood boxes as belonging to the bees, and everything in the honey supers above as mine. Some beekeepers, especially those who are new and eager to harvest their first honey crop, will take one or two frames of honey from a brood box. This is an acceptable practice only if you keep three factors in mind. 1) The colony needs adequate food stores to survive. Ask yourself if the hive has several frames of honey in addition to those you wish to remove? Are the bees still bringing in fresh nectar (seen as liquid in uncapped cells?) Are they still drawing out comb so they can replace the frame or frames you are removing? If the answer to any of these questions is no, I would leave these frames for the bees. 2) If you are feeding or have been feeding the colony, there may be sugar syrup mixed with nectar in the cells of the frames you hope to harvest. Honey comes only from natural plant nectar, so if the frames contain sugar syrup, what you would be getting would not be honey. 3) Honey should never be harvested from frames which have ever been treated with medication such as fumagillin for nosema, or with any miticide whose label says that it cannot be used with honey supers in place. Many chemicals leave residues behind in wax long after the chemical itself is gone. Those residues can contaminate honey which has been stored in the wax.

Most new hives will not produce honey for the beekeeper during the first year. Whether or not they do depends on the region of the country where they are located, whether they were started from packages or nucs, weather conditions, and luck. As compared to an established colony, new hives have a lot of catching up to do. Before they can build up their numbers to take advantage of the spring nectar flow, package bees have to draw out comb on the foundation. In your part of the country, packages are not available until April and nucs in April or early May, whereas overwintered bees can take advantage of warm days in March or even February to collect pollen and nectar from early flowering plants. By the time a new colony has drawn out comb, raised enough young bees, and stored sufficient food for its own use, the nectar flow may well be over.

If you are fortunate, and your young colony is able to produce an excess of honey, management of honey supers is relatively straight forward. Once the bees have drawn out comb on seven or eight frames in each of the brood boxes, and if a honey flow is ongoing, it's time to place a honey super on the hive. When the comb in the first super is drawn out and bees are bringing in nectar to fill the cells, it's time for another. Stop adding supers when the nectar flow stops (indicted by fewer blooming trees and plants, prolonged dry spells, and bees not filling new cells with nectar.) Once about 90% of the cells in a honey supers are capped, it can be removed from the hive, and all the honey is yours.

Don't feel bad about still having a lot of questions after attending the bee school. Local meetings, reading, and schools can only give you the ABC's of beekeeping. Your real education is ongoing and begins with the bees themselves. Open your hive, examine the frames, and make notes on what you see. Then go back to your local meeting and ask questions, or send them to me. Fortunately, in the Eastern Missouri Beekeepers Association, you are part of an exceptional education program which can help you gain the skills you need to become a real beekeeper. BC

PAY ATTENTION TO BEESWAX

Ross **Conrad**

A unique and valuable product

A colony of honey bees tends to be evaluated by the number and condition of the bees it contains. This narrow focus overlooks an extremely important component of a healthy hive: the beeswax comb. The combs in a hive can act as the skeleton, furniture, nursery, food pantry, and communication infrastructure of the colony, all at the same time. For beekeepers, honey bee comb is a source of valuable beeswax. Other types of bees produce wax that is very different from the wax produced by honey bees, of the species *Apis*. For example, certain species of stingless bees are reported to produce a wax that is more difficult to break and stickier than beeswax from *Apis mellifera*. Wax from stingless bees also tends to be dark brown and stretches without breaking when warmed.

The geometric shape of the cells found in beeswax comb result in the incredibly efficient engineering of the comb. The hexagon cross-section of each cell makes use of the least amount of material in order to create a lattice within a given volume. Hungarian mathematician, László Fejes Tóth, discovered that the shape used by the honey bee to build cells is *not*, theoretically, the most efficient shape possible. Tóth discovered a shape that would be .035% more efficient. However, this difference is too small to be measured on actual comb, and irrelevant to the colony's efficient use of wax given that natural comb varies considerably from the mathematical notion of perfect geometry. For all practical purposes, the shape of the cells that the honey bee uses allows a colony to store the most honey using the least amount of wax.

Production

Honey bees build their comb from small wax flakes, or scales, that they produce from the four pairs of wax glands on the underside of their abdomen. Wax secretion is stimulated by the retention of carbohydrates within the systems of the younger honey bees. The wax is secreted in liquid form on the ventral surface of the abdominal tergites (plates on the underside of the bee's abdomen). As the liquid wax spreads over the surface of these plates, the wax hardens as it cools through contact with the air and forms a scale. Honey bees can produce up to eight scales of wax every 12 hours when necessary. A worker bee's wax glands seem to function best when the bee is 10-18 days old and they decline after the bee is older than 18 days, usually shrinking steadily until the end of her life. However, after swarming wax production and building is undertaken by bees of all ages with young bees producing wax earlier than they would in an established colony, and older bees regressing to resume beeswax production. Bees use stiff hairs on their hind legs to pass the scales to the middle legs, and then to the mandibles (jaws) where the wax is chewed during which saliva and enzymes are mixed with the wax. When it is the right consistency, the wax is used to construct comb and seal cells filled with honey.

This is nature's way of providing for the bee's needs. As long as a worker bee has access to empty comb to store excess nectar or honey that is not immediately needed for dietary requirements its wax glands are not activated. However, when there is no place to store excess carbohydrate resources within the hive and the carbohydrates are held within the body of the bees without being digested, the bees will expend the biological energy to produce beeswax. This wax becomes the building material used to construct additional comb that will provide added storage space for the excess nectar and/or honey. Research has found that bees need to consume 6.6-8.8 pounds of honey for every pound of beeswax they produce. Wax producers also need to have previously eaten large amounts of pollen in order to have well-developed wax glands.

Workers mold the wax scales with their mandibles into circular cells while the temperature within the colony is maintained high enough that the wax is in a semi-liquid state during construction. Just as two bubbles that come together will form a perfectly straight side between them, the sides of the

An old hive body with a screen attached to the bottom is a simple way to collect wax while allowing excess honey, or rain water to drain.

A solar wax melter helps small producers like backyard and sideline beekeepers render their wax while conserving energy at the same time.

circular beeswax cells will flatten out against each other in the warmth of the clustering bees, resulting in the familiar hexagonal shaped cells that make up honey comb. In order to help prevent the nectar and honey that will be stored from spilling out of the cells, each cell is tilted slightly upward at an angle of approximately 10°.

A pound of beeswax when formed into comb can hold about 22 pounds of honey. However, the top row of cells connecting the comb with the roof of the hive, tree cavity, or top bar, can hold more than 1,300 times its weight in honey, bees, brood, pollen and wax. It is only when the temperature inside the hive increases to over 95°F (35°C) that the wax will soften and can eventually melt, causing the comb to collapse. As a result, the bees make a great effort to regulate the temperature inside the hive. The incredible load that beeswax combs are asked to carry highlight the importance of making foundation from beeswax that is unadulterated, since foundation wax made from beeswax that has been mixed with other waxes or oils can cause problems for the bees and the beekeepers.

Design Considerations

L.L. Langstroth is most often credited with bringing the idea of bee space into modern beekeeping. When allowed to build combs naturally, a colony of honey bees will leave a bee space of about 5/16th of an inch between the combs. This space assists the hive in manipulating the temperature within the hive, aids with ventilation and acts as a hallway for the passage of bees traveling across the combs.

Rudolph Steiner, the founder of Biodynamics, has noted that each cell that makes up a honey bee comb takes on the shape of a hollowed out, or inverted crystal. When filled with nectar, honey or pollen, the food is stored in the shape of a crystal. This is also the shape that surrounds each bee egg as it hatches and transforms into a larvae, and finally a mature honey bee. Given the unique and powerful forces that crystals emit, it seems likely that honey bees are making use of these energies within the hive in ways that we are only able to vaguely guess at.

When bees build comb, they create a slight bulge in the rim around the opening of each cell. This bulge forms a net of six-sided mesh over the surface of the comb and plays an important role in the complex interaction between the physical properties of the beeswax, and the bee's communication behavior. When foragers return to the hive and perform the waggle dance, they send out vibrations along the rim of the comb during each waggle run that help communicate to and recruit additional foragers in the darkness of the hive where optical signals are ineffective.

Much has been made by some as to the importance of the cell orientation within a colony. This has become known as Housel positioning, named after one of its proponents, Michael Housel, of Orlando, FL. The basic idea is that the "Y" that is formed in the base of each cell has a certain orientation that occurs when bees build their comb naturally. For bees to be healthier and more productive it is theorized, this Housel positioning should be copied when beekeepers use foundation within the hive. The idea that there is a right way and a wrong way to install foundation within the frame would be valuable information if it were true. Unfortunately, studies of the cell orientation within hives filled with combs built naturally without foundation (Roger Morse [1983] and Shumakova & Komissar [2006]) does not support this hypothesis. Bees seem to orient the cells of the comb based upon the first cell built within the comb. Cell orientation will tend to be uniform within each comb, but may differ on adjacent combs.

The Nature of Beeswax

Since beeswax is a product of the body of the honey bee, it tends to have very similar characteristics no matter where in the world the beeswax is produced. Recent research has highlighted the absorbent nature of combs built from beeswax. Among other things, disease organisms and residues from chemical pesticides that are lipophilic (oil based) and therefore soluble in beeswax have been shown to build up in comb over time. This has resulted in the recommendation that combs be rotated out and replaced on a regular basis. When using synthetic chemical mite controls or antibiotics in the hive, it is recommended that combs be replaced every three to five years. It is possible that if more natural treatments such as essential oils, organic acids, and herbs are utilized, rotation times may be able to be extended without seeing detrimental results on the colony's state of health. Since many of the non-synthetic/non-drug treatments are relatively new, long-term impacts on comb is mostly unknown at this time.

Beeswax is incredibly stable over time. Samples of wax from Egyptian tombs, the ruins of Rome, and Viking ships found at the bottom of the sea, have all been perfectly fine and undamaged. When chilled beeswax becomes brittle however, and may crack or break easily. This is why most suppliers of beeswax foundation will only ship orders when temperatures are relatively warm. The melting point of beeswax is around 145°F (63°C).

Beeswax will accumulate a whitish, frosted coating on its surface. This coating known as "bloom" is a natural part of the wax that migrates

This hand-carved pillar of beeswax was on display at Apimondia, the international beekeeping congress held in Australia in 2007.

Increase your income by processing your beeswax and selling it or making it into value added products like candles, salves, or balms.

to the surface. The appearance of bloom on items made of beeswax signifies that the items are made with 100% pure beeswax. Beeswax that has been diluted with other types of wax will not bloom. Rubbing the surface of the wax with a clean cloth will remove bloom from candles or other items. For items that are too delicate or ornate to clean with a cloth, warm water poured over it, or a blast of warm (not hot) air from a blow dryer will remove the bloom. A block of pure beeswax will have a pleasant aroma and when broken exposes a grainy surface inside. This is not the case if the wax has been adulterated with paraffin, fat or other oil.

Wax Harvesting and Processing

For most beekeepers, beeswax production is a byproduct of honey production. When honey is being extracted from the comb, the wax cappings are removed with an uncapping knife or machine. Wax derived from cappings is considered to be of the highest quality. This is because cappings wax will tend to be fresh wax that is less than a year old, containing a minimum of impurities making it very light in color. Wax collected from burr comb, hive scrapings, and old or broken combs will tend to be darker due to the increased presence of pollen, propolis, pupae cocoons, wax moth excrement, or other debris. Once it is melted down, beeswax should be clarified by mixing it with water to remove water soluble impurities such as honey, and then filtered. Small operations may use homemade filters such as sweatshirt material, fuzzy side up. Larger operations will often use steam along with a press of some kind for best results. Slumgum is the term used to describe the residues left over from the process of rendering wax. Heating beeswax above 185□F (85□C) may cause discoloration. Oxalic acid or sunlight are among the things that can be used to lighten the color of beeswax through bleaching. Certain metals such as iron, brass, zinc, and copper should be avoided during the rendering process, as beeswax will darken when heated in the presence of these metals.

Uses

In 1911, researchers uncovered a human jawbone in a cave in Slovenia that contained a lump of beeswax. Scientists theorize that the beeswax may have been an attempt to treat a broken tooth. Not much of a fix, but probably the best they could come up with in the Neolithic era.

Apart from the bee's use of wax to produce comb and beekeeper's use of beeswax to manufacture comb foundation, the number and variety of uses humans have developed for beeswax in recent history is rather astounding. Uses include cosmetics and skin care, pharmaceuticals, candles, waterproofing, food production and chewing gum, surgery, polishes, various types of sculpting and art, as well as the manufacture of musical instruments, ammunition and armaments. Beeswax is an excellent lubricant and is useful for seasoning and curing cast-iron cookware, strengthening and preserving sewing thread, and in bow making.

Beeswax is a unique and extremely valuable product that is worth more pound for pound than honey. Not being a food product, beeswax is simpler to deal with, as it does not require special packaging or storage. Unfortunately, many beekeepers do not recognize the value of beeswax and knowledge of how to collect and process it is often lacking as well. While it is impossible to give statistics, it has been estimated that only about half of the world's production of beeswax makes it to market, while the rest is thrown away, ignored or lost. BC

Ross Conrad is author of Natural Beekeeping, 2nd Edition *and will be teaching beginning and advanced beekeeping courses in Lincoln, VT during the month of May. Visit dancingbeegardens.com for more information, or call 802-349-4279 to register.*

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DOWNTOWN

Urban Beekeepers, Think Before You "Press" Your Luck

Cities offer beekeepers the chance to do unexpected things in important and even famous places, with an opportunity to surprise and even to shock that gets the attention of folks who never think about bugs and plants and their relationship to people. In this case, we're talking about the press and other media.

Frankly, it is not that hard to get some media attention for a lot of stuff that happens in urban beekeeping. A swarm landing on an urban shopping street – as was noted in London's *Daily Mail* in mid-May – can be played for clicks and terror, or a simple swarm catch near DC's Ritz Hotel, which happened a couple of days before (and was covered by reporters from both the BBC and the *Washington Post*), can make the business and the responding community seem like saints and heroes. How we persuade the reporter with the byline can make a ton of difference in how we are perceived by our neighbors.

The press is important to urban beekeepers, because the public, and more than a handful of elected officials, decide what is normal and expected based on what they are told in the morning paper and the evening news. In DC, when I communicate with officials of the police, the health department (and basically anyone else in city government) I tuck in copies of newspaper articles that mention that beekeeping is legal and welcome, because that makes it real. So far we have been lucky that the press has agreed with us about what is really important, like plants and pollination.

Everything Old Is New Again

On the flip side, a toss-off article about beekeeping at a local hotel that was published in a free weekly handed out at subway stations resulted in a Department of Health inspection and attempted crackdown, at that business. They believed that their jurisdiction over beekeeping was being flouted in public. That department had never policed beekeeping until they were embarrassed, however.

Being note worthy – being called by a reporter! – can make your head spin, but the message is only as good as your understanding of the messenger. Despite what the Kardashians might tell you, all publicity is not good, or helpful to your cause. Like beekeeping, a thoughtful and informed approach, with some planning ahead of time about how you would like things to turn out, makes all the difference.

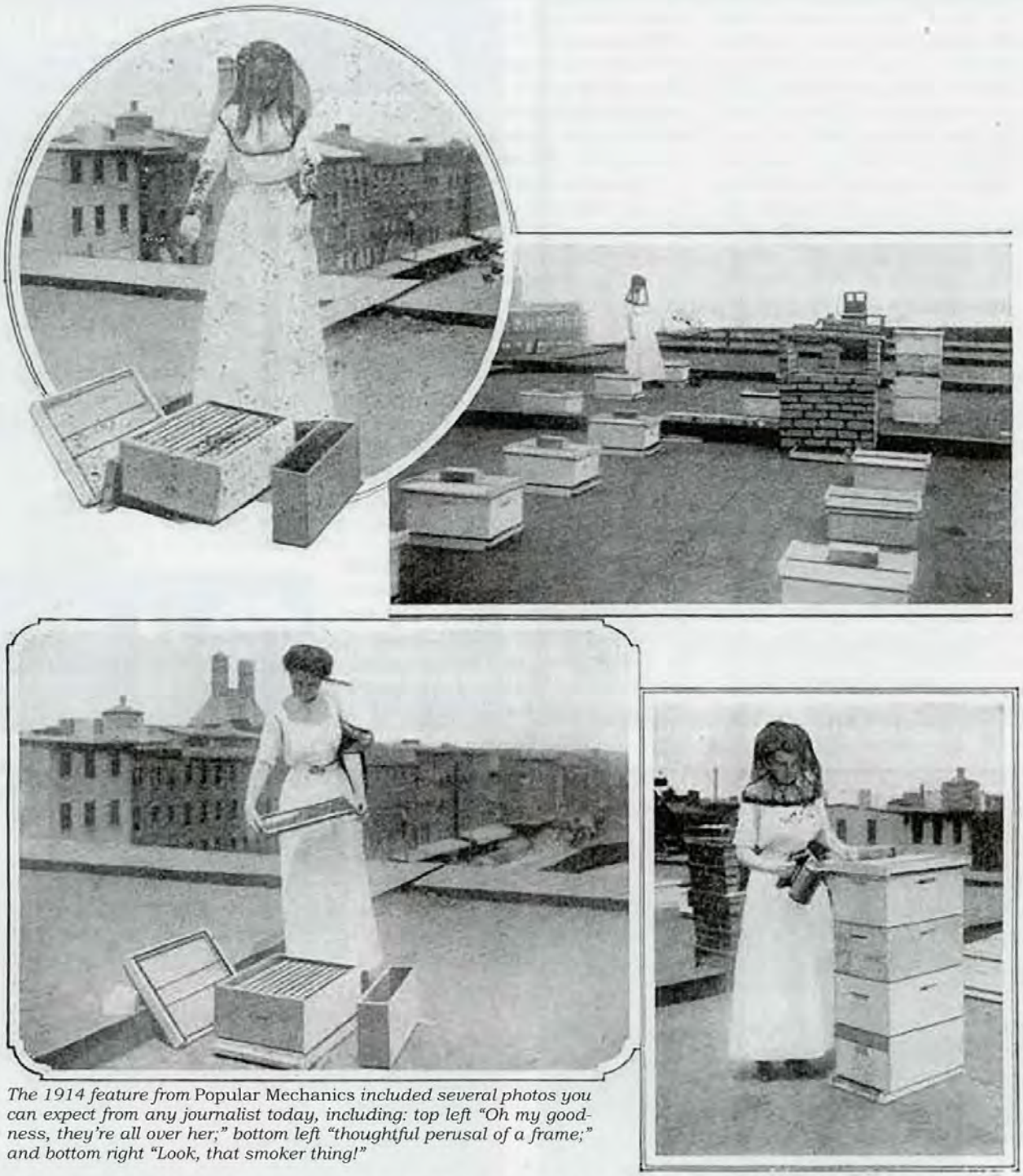
The short version of this article goes like this: reach out to local print reporters, watch out for the agendas of national or international writers. Local TV is a problem waiting to happen, while national coverage has potential. Radio is usually OK, but the Internet is a total wild card. The more precious the topic is to you, the more you should worry about sharing it with anyone else. And our bees are precious.

More than one local beekeeper, mostly in good spirits, has told me that the publicity they saw other city beekeeping projects and adventures receive has taken away their sense that they were a kind of celebrity, the "Only One." If practicing beekeeping is a means to be outrageous, unusual, or a person apart from the interwoven life of the community, none of this advice applies to you.

Motives Matter

Reporters have their own reasons for deciding to write, talk, or spew vapidly about urban beekeeping. You can still get a fair amount of attention by letting journalists and others know that you are a beekeeper in the city. You just better have some inkling of what they are likely to do with it. Before you talk to one you should work out your own motivation for talking to the public through a third party. Mostly, our beekeeping community is made of up of folks who want urban agriculture to become part of the normal, daily DNA of city living, and we do this by showing how beekeepers have been helping out for a long time, and how bees have been in the city for even longer than that. That's what we tell the press, too.

Every city also has beekeeper celebrities, to whom personal notoriety, bravado, eccentricity, and heroism are *way* more important than being a normal part of life. Unfortunately, the press eats this up, and our neighbors grow worried.



The 1914 feature from Popular Mechanics *included several photos you can expect from any journalist today, including: top left "Oh my goodness, they're all over her;" bottom left "thoughtful perusal of a frame;" and bottom right "Look, that smoker thing!"*

This is not our tribe, in the main. The beekeeping community talks caring for bees and people, about continuity, about looking out for folks who may be worried about stinging insects, about the environment, and about making an increasingly urban future somehow work. We talk about hope, and how we want to share it. And about how crazy miraculous so many things about bees are, and how we learn about the functions of complex conurbations by watching our insect partners who collaborate so similarly to us. And then we give them some honey.

Those are *our* motives. There is also the part where you check out, ahead of time, the reporter to whom you are speaking. Most of them have personal websites or Twitter accounts that you can review for professionalism, snarkiness, and overall sympathy to green or scientific discussions. If the reporter who contacts you has never covered a green or scientific topic before, and scores controversy or shock value points on a regular basis, ask yourself whether you want to be their target of the day.

The Kind of Media Matters

Here in Washington, there seems to be a pattern to the motivations of the reporters to whom we speak. We have neighborhood newspapers with circulations that rival all the major beekeeping journals combined, and these are staffed by freelancing neighbors with a stake in making our communities feel special. Usually

their reports take the form of "How Cool Are We?!!" They will want to have specific local examples of positive beekeepers in the 'hood, and you will need to know who wants that kind of recognition ahead of time, and whether you are ready for your own neighbors to know. They are not usually interested in blowing up beekeeping, but in making the community feel special that it is present.

Print journalists from the city daily to *Time* also seem to have the wherewithal to take a longer view and to compose their thoughts in a balanced way. Their information product about beekeeping does not need to take less than 60 seconds, and stinging insects in densely settled areas need that kind of time.

Local TV, however, never seems to be a big win. These reporters don't show up unless someone called 911, and even if you get a thoughtful counterpart, there will be a snickering anchor with something to say about "killer bees." This appears to be a law of media nature. I will do practically anything to spike a local TV report about beekeeping.

National broadcasters try to do better. We've had positive pieces from CNN, Associated Press TV, and VOA, and one time we got CBS national to do a cool interview with a downtown teenage beekeeper. Though Alison rocked it, her piece got bumped for coverage of – Balloon Boy.

Radio has real potential. If you can get with your NPR affiliate, they are primed to be friendly before you face your first microphone. But our traffic and weather station also publicized our short course, in part because we had clear (and short) recordable statements that they could report with little editing and lots of green credentials. And we asked them, point blank, to be nice to us, because we are doing the best we can to make a future for bees and for the planet.

Everything Old is New Again

But I wonder why this is all still news. If you flash back to almost exactly 100 years ago, the October 1914, *Popular Mechanics* included an article titled *Girl Has Profitable Bee Farm on Urban Roof* (a reference thanks to Dewey Hassig). When I look at that article today, I notice that the "profitable bee farm" seems to involve brand new woodenware in single deep—like a lot of YouTube videos featuring beekeepers in bright and unstained veils—and if you changed the "girl" in the article's clothes from long white cotton to Kate Spade and her job from stenographer to graphic designer, you could run the rest of the article verbatim.

Somehow, somewhere about the time that cities got big and the country seemed like a really different place, beekeeping became an odd and newsworthy occupation, though there were always urban beekeepers and we always belonged here.

That is the message we need to convey. BC

Toni Burnham keeps bees on rooftops in the Washington, DC area where she lives.

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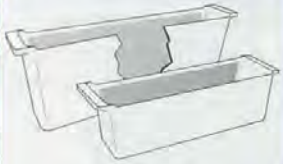

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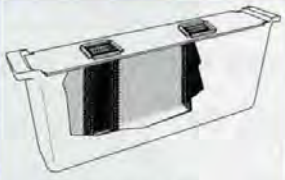

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A Trio Of Leguminous Bee Trees

Connie **Krochmal**

The leguminous trees are excellent choices for the bee garden. Like most other plants in this group, these typically share at least two identifying characteristics – bean-like pods and compound leaves. Black locust is one of the best known species.

Black Locust or Locust (*Robinia pseudoacacia*)

The Latin genus for black locust was named after Jean Robin (1550-1629), who was director of the Paris Botanic Garden. This thorny tree is also called yellow locust, false acacia, and honey bean.

Of the 20 or so species, this is by far the most common. It has naturalized and spread widely from its original range within the Ozarks and Central Appalachians until the tree occurs in the East from Pennsylvania to Georgia westward to the Great Plains. Black locust often grows in deciduous forests.

Because it suckers and readily self-sows, the tree can spread to where it is unwanted. The roots survive and produce new shoots when a tree is cut.

This tough tree with deeply furrowed brown bark is picturesque during the Winter when the crooked limbs and the twisted, irregular trunk are clearly visible. A fast growing species, it is usually 25 to 40 feet in height. Black locust can reach 60 feet or more under favorable conditions.

Although the natural shape can vary somewhat, the tree is mostly upright or rounded and open with an irregular crown. The trunk is usually straight to irregular. Mop-headed and columnar varieties are available.

As with other locusts, black locust has spines, which are borne in pairs at the base of the leaves.

The alternate, compound foliage is over a foot in length. This features numerous small, blue-green to deep green leaflets, 11 to 23 in number. Rounded to oval, they're very delicate and fine textured. These are only two inches long and an inch wide. They're arranged in a feather-like fashion with an odd one at the end. One variety has yellow foliage. The pods can reach four inches in length.

Black locust can bloom at a very young age. Very floriferous, this tree is covered with richly fragrant blossoms. Usually white with yellow blotches, the flowers can also be light rose or pink. The pea-like blooms feature five petals. They emerge in cascading clusters, eight inches long, which resemble those of wisteria. These appear in late Spring, usually in May and June, with the leaves. One variety, Semperflorens, blooms sporadically throughout the Summer.

Easy to grow, black locust is an adaptable plant. This drought tolerant, disease resistant species is very suitable for eroded areas, poor soils, and difficult spots. Although the species is hardy to zone three, the young growth can be damaged by late frosts. The twigs and branches, which tend to be weak wooded, can break during heavy storms.

The tree adapts to most soil types, even poor ones, provided they aren't constantly wet. The ideal soil is rich, well drained, and sandy. Black locust is tolerant of gravel and limestone soils. It withstands slightly moist to somewhat dry conditions. A neutral to slightly acid pH is ideal.

Black Locust.

Several species of boring beetles attack the stems and branches of black locust in some areas of the country. Affected trees can gradually die from rot that develops in the tunnels the insects leave behind. Should locust twig borers damage the tree by causing galls, the affected twigs can be removed. Leaf miners and scale are minor pests.

For the most part, black locust prefers full sun to partial shade. The tree is resistant to salt spray, air pollution, smoke, and dust. Adapted to city conditions, it makes a good street tree. Prune this from late Fall to late Winter. The plant casts dappled shade where other plants can be grown.

Easy to transplant, black locust is propagated by seed, root cuttings, softwood cuttings, grafting, and budding. Some cultivars are grafted onto seedlings. A campaign known as the Black Locust Initiative pioneered a new method of propagating this species. Called air spading, this involves the use of an air spade to remove a root section, which is cut into segments and planted as root cuttings.

At least 20 varieties of black locust are available. Considered to be one of the most valuable, the Shipmast locust features wood that is extremely resistant to decay. Only 20 feet in height, Lace Lady is a cultivar with crinkled foliage and contorted, kinked stems. Since neither of these varieties comes true from seed, they must be propagated by vegetative means.

Black locust became the very first American tree to be introduced to Europe in 1601. Following that, it naturalized widely on the continent. It remains one of the most widely planted trees in the temperate zones as well as in the Mediterranean region, Russia, and Asia. Black locust has been planted in many parts of the globe for reclamation, especially for strip-mined areas,

reforestation, erosion control, and timber.

The bees eagerly work black locust blooms. Along with the other species, the black locust is a major nectar and pollen source in all regions of the country. Strong colonies are needed to take full advantage of the heavy nectar flow for this can come fairly early in the season.

The flowers yield copious quantities of nectar for a total of over an ounce per blossom. Cold weather can hamper the flow.

The length of the nectar flow can vary by location as well as by cultivar. It usually lasts for about two weeks. In Europe where the tree is widely grown, black locust tends to bloom for a slightly longer period.

The surplus honey crop can vary by location. Typically, it can be 132 pounds per colony or up to 15 pounds per colony per day. Black locust honey is comparable in quality to clover.

Like clover, this premium honey is usually very sweet and mild. However, the flavor can sometimes be stronger. The honey has a rich aroma and heavy body. It has been known to remain liquid for several years. Eventually when it does granulate, this develops large crystals as well as small, fine grains.

The color of the honey can vary widely. It can be very clear, water clear, water white, very light colored, or pale yellow. If it isn't from a single floral source, this honey will often have yellow tinges.

A number of related species are good bee plants. These include rose acacia or bristly locust (*Robinia hispida*), a shrubby plant found mainly from Georgia to Virginia. Clammy locust (*Robinia viscosa*), which was originally native from Alabama to Pennsylvania, has naturalized in other parts of the East. New Mexican locust (*Robinia neomexicana*) occurs mainly in the Southwest. This has reddish-pink blooms.

Kentucky coffeetree (*Gymnocladus dioicus*)

Also known simply as coffeetree, this beautiful native tree is an outstanding choice for large bee gardens. Recommended for zones three through eight, Kentucky coffee tree is a large, drought tolerant species. Grown as a shade tree, it casts light shade. Historically, a number of related species once grew around the world. At least one species became extinct in Europe perhaps 70 million years ago. One relative is still found in China.

Although the Kentucky coffeetree is found over a wide area of the East, Midwest, and the Central states,

Mimosa.

the species is by no means common within these regions. Its range extends from New York and Pennsylvania to Alabama and Louisiana westward to South Dakota and Oklahoma. The habitats include floodplain terraces, river valleys, limestone woods, and rocky hillsides.

With an open crown, Kentucky coffeetree reaches 90 to 100 feet in the wild. In a landscape setting, it is usually 60 to 75 feet. This has a narrow, rounded open crown and straight trunk. The deeply furrowed, scaly bark is gray. In Winter after the leaves have fallen, the lovely contorted branches lend seasonal interest. During the growing season, the showy reddish twigs add color.

Kentucky coffeetree is late to leaf out in the Spring. When the foliage first emerges, it is initially vivid pink-bronze. Hairy when young, the leaves resemble those of the walnuts. Each branch of the compound leaves contains five to seven oval leaflets, four inches long. A variety with variegated leaves is available.

The gorgeous, scented, almost tubular blooms open from May to July. Reddish on the outside, these feature greenish-white or whitish-purple petals. The male and female blossoms open on separate trees. The former are only half as long as the latter. The flowers open in large branched clusters or panicles. Male clusters are four inches in length, while the females are three times as long.

The large, tough, woody pods are thick and flat. Deep reddish-brown, these reach a foot in length. Fruitless male cultivars can be found.

Initially rather slow, the growth rate increases over time. This relatively long lived species can survive for over

Colony Loss numbers are in! Thanks to ***over 7,100 participating beekeepers,*** the eighth annual national survey of honey bee colony losses for the 2013/2014 winter season **reported that 23.2% of managed honey bee colonies in the U.S. died.**

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a century. Suited to full sun and partial shade, Kentucky coffeetree is tolerant of moderate winds. Adapted to various soil types, it does best in average, well drained, moist to moderately dry soils with a neutral to slightly acid pH. However, it will tolerate some alkalinity. In the wild, this typically occurs in deep, rich moist soils.

The plants require very little care. If pruning becomes necessary, it should be done during the Winter. This tree experiences relatively few insect or disease problems. Kentucky coffee tree is propagated by seeds and root cuttings.

The Latin name for the genus translates as 'naked branch.' Some say this is due to the lack of buds on the soft young wood. Other experts say it describes the twigless branches. This is called coffeetree because European settlers roasted the seeds and used them as a coffee substitute. A toxic substance in the raw seeds is deactivated during the roasting process. Appropriately enough, this has been chosen as the state tree for Kentucky.

The tree has been widely used as timber. At one time, the leaves were ground and used for a fly poison.

Kentucky coffeetree is a good nectar source. The blossoms rarely fail to attract bees, which serve as pollinators for the plant.

Mimosa or Silk Tree (*Albizzia julibrissin*)

This tree was introduced from Central China and Persia. Like the sensitive plant, the leaves curl up in the evening.

The species is suited to zones six through nine. The hardiest cultivars, such as Ernest Wilson and Rosea, grow as far north as Massachusetts. Mimosa can suffer some damage during particularly harsh Winters. If this occurs, prune the affected stems. Due to sporadic Spring temperatures and late frosts, mine has been leafing out later than usual during some years.

Usually 30 feet or less in height, mimosa can occasionally reach 40 feet in warmer areas of the South. It develops a very broad spreading crown.

The alternate, doubly compound leaves are so finely divided that each leaflet is composed of many individual leaflets. These are ¼ inch or less in length. Mimosa bears flat, pea-like pods, six inches in length.

Very free flowering, mimosa begins blooming at a young age. The blossoms emerge in round, compact heads. The flowers, two inches wide, are light pink and white. Some cultivars feature deep pink blooms. The long colorful stamens, which resemble brushes, are quite conspicuous.

Somewhat short lived, mimosa does best in full sun. Tolerant of hot, dry Summers, this grows in average soils with moisture levels ranging from slightly moist to somewhat dry. It is pH adaptable and withstands moderate winds.

Often self-sowing, mimosa is easy to grow from seed. At times, the mimosa webworm has been known to disfigure the leaves. In some parts of the South, a soil-borne fungus known as mimosa wilt can affect the plants. Resistant varieties are available.

Various cultivars of mimosa are available. Ombrella bears scented, hot pink, powder-puff type blooms, six inches in length. This cultivar is 35 feet tall and wide.

Mimosa is a major bee plant in some areas of the South. It yields nectar and pollen. The flowers are frequently visited by bees. BC

Connie Krochmal is a writer and beekeeper in Black Mountain, North Carolina.

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BIGGER PICTURE

Jessica **Louque**

Backing Up Your Business

The beginning of the bee season can be a time of anxiety and stress for some beekeepers. If you're a beginner beekeeper, the excitement of your first bees coming in is tempered with worrying about if you're doing things right. If you are an experienced beekeeper, it can be a headache and hassle of missing queens, delayed equipment, emergency strategizing, and fervent prayers of bee salvation. This has been my experience for 2014, and hopefully some of my issues will help all the readers not have the same problems.

It all started with ordering equipment late. For various reasons, nothing was ordered as to what I consider "on time" for the bee season. With a few phone calls, everything was more or less handled (apparently more on the "less" side than I realized). We were gearing up for 225 packages of bees arriving, which meant new equipment, a minimum of 2,200 pounds of sugar a week, feeder tanks, etc. I thought everything was under control, as bits and pieces of the orders were coming through. The first set of packages arrived a day early, which was nice. In all good fortune, it turns out that the original packager didn't pop the cans of syrup so the bees were starving. If we had picked them up the next day, I think we would have had significantly lower success (currently lost one of 25). These turned out okay, other than the equipment not being delivered on time despite forewarning, and having to go pick it up. My husband in particular is adamant about keeping business in the state to support the local economy, so we let that one slide since they were in-state even with about a 3.5 hour drive each way. The second order for 200 packages was going to be significantly more time. The Carolina Honey Bee Company helped us out with making sure we had enough packages, coming in early so we could get on the road faster, and offering to deliver for us next year so we wouldn't have to drive so far and to help with package installation. Now THAT is service!

For the next order, which I knew would be quite large to get in 300 boxes, 3000 plastic frames, and the general equipment for 200 hives, I ordered six weeks in advance, where I was assured that it would be no big deal to arrive on time. I explained that it may take a few days to get the check to them after the invoice, so we had to get this rolling. This particular company was going to send an invoice once they had an idea for shipping costs. Three weeks go by with no notifications from them, so I start calling back. I was informed that it was the shipping company that was the hold-up because they wouldn't give an estimate. A few days later I finally had an invoice, but about a third of the equipment was now backordered. Only maybe a thousand frames were available, some boxes, robbing screens... did I want to go ahead and pay? It would definitely be here on time. I called Dadant in Chatham, where Mark Bennett was more than able to help us out with the additional equipment. In which case, I agreed to the invoice barring the backordered items, and the check was sent in. This check, mind you, is from a corporate company, not my personal checking account. We were now to the week prior to the packages arriving. Now, the bee company was saying that although they had the check, it was a hassle for them to take it to the bank, and then the day after was Good Friday, and they were probably open but didn't want to do it then either, and then said that they wouldn't even have the packers wrap up the order until the check cleared the bank, maybe by next Tuesday or Wednesday, depending on when they would have time to take it. Then, they hung up on the account manager and the bank representative while he was trying to explain that the funds were available in the bank right now, so please process the order. It rolls around to Monday of the week of package arrival, and lo and behold, the check is returned. They decided they didn't want to fulfill the order on such late notice. I don't know about you guys, but this should put you in a near state of panic to have 200 packages arriving and no equipment for them to live in. Again, the first

200 packages of bees from The Carolina Bee Company.

40,000 pounds of sugar in the truck.

resort is Mark over at Dadant, who has his guy pull out their entire inventory to make something work for us. Two trips later, and we have everything we need, with a bonus of some cheaper gas since Virginia has lower taxes. Many thanks and lots of appreciation go out to Mark for helping us out of a Tightsqueeze (pun intended for those of you who know the address of Dadant's Chatham location).

We also needed the plastic lined hivetop feeders. As far as I can tell, there's only one bee company that sells these. Again, ordered six weeks ahead of time, and with an open account at this particular business. While calling multiple times, there was never any email confirmation, account number given, or anything like that. In the beginning, there wasn't a truck with a liftgate that could ship the order. Since there was no liftgate, I guess they figured there was no need for inventory to sit around, so they sold it. Twice. At least, this is what I was told when I finally got to a person and not a bizarre person-answering machine hybrid. On my last round of calling, the person I spoke with seemed to be a bit more competent and said he had no idea how that had happened, but all they had was 180 in stock of the 235 that I needed, but that he would make sure those arrived before Saturday. True to his word, 180 feeders arrived late Friday morning, just as new panic was setting in since we were just leaving to drive down to South Carolina for package pickup. One more time, Dadant came to the rescue with 20 extra feeders to hold us over until the remaining feeders came in. Since the salvaging of the feeder emergency was successful, that particular company received a second chance. There was a lot of equipment needed that only they and the bee company that bailed on us sold, but it wasn't absolutely essential for the packages. The remaining feeders were delivered promptly on the following Monday morning, along with most of another large order that I'd placed the week before to replace non-essential equipment that was on the rejected order.

In the midst of this, it is, of course, garden season. We were trying to get our personal space up

One of many "emergency" equipment purchases from Dadant in Chatham.

and rolling, as well as needing to get fields ready for buckwheat for the bees. Not having the time or energy to pick up a topsoil/compost combo, we ordered 10 cubic yards to be delivered to our house from the local greenhouse/nursery place. We used compost from them last year and it was a bit too hot for the plants, so we thought the mix might be a good idea. Again here, trying to support the in-state business with a locally-owned shop instead of a larger entity. We weren't home, and when we stopped

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Not 10 cubic yards.

at the house, it looked like they had delivered approximately half of the 10 cubic yards. I called back to the store, where the owner told me that they put it in the truck with two scoops of their five cubic yard bucket, but he'd have a driver go out and look. I explained that we had about eight cubic yards of mulch sitting nearby and the compost pile was nowhere near as big, but he informed me that of course mulch would be a bigger pile. The driver goes out to look, and says that looks about like 10 cubic yards to him, and that I should be fine, and hangs up. It irks me to say that if Bobby had called instead of me, I don't think they would have disregarded his opinion quite so easily. For those of you who are math-challenged like me, let me explain quickly what I was expecting, and what I received. The compost should have taken up an area that was 30 feet wide by 30 feet long and three feet high, as that would equal 10 cubic yards (one cubic yard would be a box-sized area of three feet high x three feet wide x three feet long). Perhaps my pile reached almost four feet in the center, dwindling off to a rough square of 11 feet by six feet. With his argument of compost vs. mulch probably made sense in his mind since compost is more dense, I didn't order a weight, I ordered a volume of product. Also, I'd like every one of you to think about how big a bucket on a tractor would have to be to fit five cubic yards in it. That bucket would need to be 15 feet across just to get close, so I know they are being squirrely. Just as a comparison, our buckwheat field compost came in from a different supplier, with 16 cubic yards on a truck. This pile was more than twice the size of the delivered pile from store #1, and over $100 cheaper WITH delivery. After asking about the situation, it was brought to my attention by a small group of people that store #1 was notorious for underselling their products. Good to know for the future.

I know that some of my stresses could have been avoided with ordering in advance. However, if a company promises you goods or services, they should stand behind their word. While I will never again use the two companies that left me in a predicament, I can at least say that one redeemed their services and Dadant and The Carolina Honey Bee Company will have a loyal customer from here on out. BC

Jessica Louque and her family are living off the land in North Carolina.

Is It Winter In July?

Beekeepers need to be thinking ahead to Winter!

Ann **Harman**

In Antarctica, yes. But here in the temperate area of the United States Winter is far from our minds. (If you are complaining that today is a scorcher, please think back to last Winter – those thoughts may cool you off a bit.) At this time you may have pulled your honey off and your thoughts are that the bees will be just fine until you check on them in early autumn to get them ready for the coming Winter.

Actually that colony needs to be thought about during July. Remember that August is the bees' New Year. Depending on your climate, in August your bees will be either producing Winter bees or getting ready to do that. Now just who is going to take care of the Winter Bee Project in August and September? The queen and those bees that are in your hive in July – the field bees bringing in food, the hive bees taking care of brood, and the brood itself – when those become adult bees. Bees are really so efficient. It's the beekeeper who is always running to catch up.

Perhaps the major item of concern during July is *Varroa*. Your colony has been doing very well, meaning plenty of brood starting in early Spring to bring you that honey crop. However, the more larvae the more mites. July is a great month to evaluate your *Varroa* control. No, you cannot eliminate every last one of them but you can control the *Varroa* population.

When was the last time you checked your screen bottom board? Probably in the middle or at the end of March when you went through your hives to see how everything was after the Winter. Some colonies keep the screen bottom board, and also solid bottoms, very clean. Other colonies don't bother getting rid of trash. July is a hot month so any ventilation is beneficial. Take a look now and make a note (you are keeping records, aren't you?) of untidy colonies.

Do you think your *Varroa* monitoring techniques – powdered sugar, sticky boards, drone pupa pulling, etc. – are giving you good information? Now is a good time to review those. Think back to the end of Winter in your area. How did your bees cope with Winter conditions? We cannot escape Mother Nature's wintertime tricks (or Summer ones, either) but plenty of food and plenty of healthy bees can get bees through the Winter in good condition.

Do you plan to use one of the *Varroa* medications? If so, review them to see which one would be the best for your bees and for your climate, as well as for your approach to beekeeping. The equipment suppliers have good descriptions in their catalogs or on their websites. Please pay attention to the label instructions for the temperature range. July is a hot month! It may be too hot in your area to use some of the medications.

Why so much fuss about *Varroa*? Well, it is considered the Number One problem of bees in the world. It is impossible to eliminate them from our hives. But it is possible to control them and the damage they can do. Take action in mid-Summer. September may be too late. You need those strong, healthy Winter bees.

While we are thinking about pests, we need to consider the small hive beetle. In areas with loose sandy soil and reasonable or high humidity, the small hive beetle can be a terrible pest. In those areas with heavy, dense clay soil or low humidity the shb can just be a nuisance. However, any stress that a colony has to endure is simply not beneficial to its overall health and success. Since you are reviewing your *Varroa* control program, give a thought to your beetle control program.

You thought July would be a quiet month for your beekeeping. In some ways yes, but it is an excellent month for review.

As long as we are thinking about health problems, let's consider *Nosema ceranae*. This is again a worldwide problem. Early research showed that ceranae was quite different from the familiar *Nosema apis* that gave problems during the Winter. This nosema seems to be infesting the bees the year around. Unfortunately no consensus seems to exist on exactly what to do, what is best for our bees. Plenty of food and plenty of healthy bees seem to be the best defense. However, keep up with information from current research.

Beekeepers tend to make thorough inspections of their colonies in the Spring. If all is well at that time then all must be well in July. Maybe. When you made those Spring inspections you probably decided if a queen or two needed replacing after the Winter. Now, some months from Spring, have you thought about all the queens? Do you have records about the ages of your queens? If so, it's time to review those to see if an Autumn requeening will be needed.

Go ahead and see what your queens are doing. Note the colonies that need a new one and decide on the appropriate time to requeen. Those new queens will be needed to lay the eggs for the Winter bees.

Did you have similar honey harvests from all your colonies or was there one that just didn't produce? Now is the time to decide the fate of that wimpy colony. It does not show any signs of disease or parasites. Its problem is probably a wimpy queen. July is an excellent time to decide on her fate. A new queen could definitely be in order. However, would those bees be a good addition to another colony a bit later? Remember: one wimpy colony plus another wimpy colony equals a wimpy colony. Nothing really gained. Go ahead and blame the queens but don't try to coddle along a wimpy colony. If you do, your reward will be a dead colony before next Winter ends.

Have you been keeping track of your weather, at least during the past month or so? Too much rain? Too little rain? Some parts of the United States may have been experiencing drought, even severe drought conditions. You probably paid more attention to the effects of drought on your tomato plants. Bee forage will suffer from drought – small and sparse blossoms, very little nectar. Go ahead and water your tomatoes then mix up some sugar syrup for feeding your bees.

It does not matter what month your calendar says.

What about too much rain, especially day after day? Bees will stay home. Incoming food, pollen and nectar, could be in short supply. Plants tend to grow more foliage but not necessarily more blossoms. Nectar may be more dilute. The higher level of humidity will make it more difficult for the bees to evaporate water from the nectar.

There is no point in adding more stress to your colonies by plowing too frequently through the hive to discover what is going on. Take a few minutes and watch bees at the entrance. Do you see any arriving bees with pollen? Those appearing to arrive with 'nothing' could be scout bees, nectar carriers, water carriers – or actually really nothing. Link the weather with action at the entrance.

Nobody with pollen? Brood is still being reared. Check entering bees at different times of day since blossoms release pollen at different times. Sunny and incredibly hot? Bees will be bringing in water (the 'nothing' bees). Do you know your water sources? In severe drought conditions tiny streams may dry up completely. Are you familiar with the nectar plants in your area? If not, find out to make certain some of those 'nothing' bees are bringing in nectar. Bees fanning at the entrance? Good! Nectar being evaporated and/or the cooling-hive bees are at work. Watching bees at the entrance is lots of fun and quite informative, too.

Now that the July assessment of colony conditions has been done you can make your plans for the months to come. Remember – those plans must be somewhat flexible – weather from now until next Spring can alter them.

When August, or early September, arrives you may be requeening. Those beekeepers who plan to overwinter nucs will be caring for those. In many temperate areas August can be a dearth month for blossoms. However the eggs for winter bees will be laid. These are the bees responsible for successful wintering of a colony. The larvae will need good nutrition to be vigorous healthy bees.

In general beekeepers just have the months of August and September to help the bees create a good Winter colony. As cooler weather and diminishing light appears in October many perfectly healthy queens are guided into diminished egg laying, beginning their rest period.

You have turned the calendar page to October. The colorful Autumn leaves will give you a pleasant backdrop to your finishing touches of preparing your hives for Winter. When Halloween arrives you should be finished with hive work. The queen is resting. Plenty of pounds of honey are available for Winter. Promise your bees that you will look into the hive from time to time to be certain all is well. Now you can go and enjoy goblins and ghosts and skeletons!

The calendar says November now. If you have done a good job of feeding you can finish cleaning up the beeyard, your smoker and hive tools. Be certain you launder any bee jackets or coveralls that you have been wearing. Dried venom, if inhaled, can cause venom allergy.

Did you think you could ignore the weather? No, indeed. A good chilly November keeps the bees in a cluster and being conservative of food. A series of warm days for flight means the bees are eating more. Will their food stores last the Winter? Make a note in your records because when January arrives you will have totally forgotten November.

The days are now short and cold, telling us it's December and Winter. Is there anything special to note about the weather this month? Find a day, just one day, in December when you could remove the covers and take a quick look inside. The grumbling hum of annoyed bees does tell you that they are in residence. Since it is early in Winter you probably will not see the bees. That means they are far below their stores and doing well. Gently replace the covers and wish them a Merry Christmas.

And you thought July would be a quiet month for beekeeping. BC

Ann Harman has been getting her bees through Winter for many years at her home in Flint Hill, Virginia.

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ABOUT BOTTOM BOARDS

Jim **Thompson**

One of the decisions that a new beekeeper faces is what kind of bottom board should be purchased and what is the purpose of the bottom board? Typically the bee suppliers offer a reversible bottom board which has one side with a 3/8" space above the floor boards and a ¾" space on the other side. The idea of having a bottom board of this nature is to use the ¾" side under the supers during the Summer and then reverse the bottom board in the Fall to have the narrow side under the super to serve as a deterrent for mice. This would appear logical, but usually by the time one decides to reverse the bottom board it is too late in the year or the hive is too heavy and so the bottom board remains in one position all year around.

Some beekeepers make the decision to keep the narrow side of the bottom board active all year so they believe that the mice will be kept out. What they don't realize is that the bees need ventilation through the hive to help cure the honey and so one should use the ¾" side. In a hive that is fairly air tight, the bees will fan air into the hive on the right side, usually, of the bottom board and after the air circulates through the hive, it will be exhausted on the left side. However this pattern of air flow is altered by drilling holes in the supers, the insertion of sticks under the inner cover, the staggering of the supers, the cracks from rotting, ill fitting supers, or unusual frame development.

When one uses the deep side of the bottom board, they learn that the bees will build propolis mounds on the bottom board to allow the bees to walk up into the hive. A normal mistake that the beekeeper does in the spring is to scrape off these "ladders to the combs" and cause the bees to start all over again building the mounds. Thus you should clean the debris off around the outer two or three inches of the bottom board and leave the ladders.

When you dump the debris off the bottom board, make sure that you either dump it into a bucket or way behind the hive out of the foot traffic area. The dead bees and other debris make very good fertilizer and if it ends up in front of the hive, you may have a tall grass problem or a wax and propolis build up on your shoes.

Bottom boards can be made from many types of material. Those that are made of plywood bubble and/or separate. Particle board and Masonite usually start to disintegrate as the adhesiveness of the glue is lost. Most of the bee suppliers offer solid wood bottom boards and the usual choices are pine or Cyprus.

Cyprus bottom boards are supposedly more rot resistant, but that pertained more to the old growth Cyprus. Therefore one should plan on putting a protective finish on the bottom board.

There are many choices as there are paints, stains, solutions that penetrate the wood, and dipping solutions such as gum rosin and paraffin. The bottom board may be coated entirely, but the only thing that a beekeeper should be aware of is to make sure that the finish does not contain any chemicals that are toxic to the bees.

In setting up the hive, you should make sure that the hive is level so the bees will draw the combs in a satisfactory manner. However in the late Fall or early Winter you should consider putting a shim under the back of the hive or tilt the hive slightly forward to allow moisture from condensation to drain out the front.

In 1948, Walter Diehnelt invented a bottom board that had the floor boards of the bottom board fitting in an angular dado on the side rails. These bottom boards had the deep side available for ventilation at the front of the hive and the slope for the water drainage. However they never were popular as a beekeeping item. Perhaps it was due to the complicated angular cut on the side rails or that most hives were supported on the floor boards with concrete blocks thus giving the hive a constant tilt in the wrong direction.

Another bottom board that never became popular was the one way traffic board invented by John Musgrove. A cut in the side rails was made so a bent 1/8" hardware cloth screen could be inserted. The screen allowed the bees to walk out of the hive below the screen, but returning bees would land on the screen and walk into the hive. I don't know why this was never popular, but I suspect that the reduction of guard bees at the front exit and the elimination of guard bees at the true entrance may have been a problem.

The extra deep bottom board that contained a removable slatted rack also never worked out well. The idea behind this was to provide a barrier to prevent mice to

Reversable Bottom Board

One Way Traffic Bottom Board

Slatted Rack

Screen Bottom Board

Plastic Bottom Board

Heilman Bottom Board

go up into the combs, make it dark inside the hive so the bees would draw the combs to the bottom of the frames, and provide an indoor clustering space. All of these ideas have merit, but it overlooked that the ladders to the combs would have to be even taller and now there were two spaces that the bees had to cross to get into the hive instead of one. Pictured is a regular slatted rack which would sit on top of a bottom board and do essentially the same as the bottom board with a removable slatted rack.

The screened bottom board was an idea that was written about in a *Bee Culture* issue of 1904 to allow bees to have more ventilation in the hive. This idea has resurfaced in recent years to aid in mite detection and some control. Some of the models have provisions to have a slide to allow sticky board insertion and/or stopping the air flow during the cold months.

As an experiment, I have placed a hive on cross rails so it didn't have a bottom board and found that the hive did fine (as was used by Charles Martin Simon). The only problem with this kind of arrangement is that you would have difficulty in moving the hive as you don't have a front entrance to monitor or a way to restrict the bees while you are picking up the hive.

Plastic bottom boards have become popular as they do not rot. However the first ones were slick and the hive bodies would slide off the bottom boards if there was any slope to the hive. Thus small flanges were added to the rails that would fit inside of the supers and that problem was solved. Then it was noticed that because the floor of the hive would bend in the middle if the hive was not supported correctly, so an additional support was placed in the front center of the bottom board. However the addition of the front support interfered with the practice of using a "V" shaped screen when you wanted to move the hive.

Many of the commercial beekeepers have special pallets that hold four hives. The bottom boards are built into the pallet. This allows the beekeeper to use a fork lift to move four hives at once. Because the bottom boards are not in direct contact with the ground the rotting issue of the bottom board is reduced.

There are some beekeepers that will permanently attach the bottom board to the hive. Maybe this idea is a throwback to the time when there were hives like the Buckeye hive that had permanent bottoms. Then you got involved in a lot of frame moving. However the fixed bottom may help in situations where one is catching swarms, moving hives, or raising queens. If you are using nucs, the attachment of the bottom board is a common practice.

I have seen the "standard" reversible wood bottom board break and rot out very quickly. The bottom boards just don't hold up to having a ratchet strap wrapped around them, so a beekeeper friend, Dave Heilman, designed a bottom board that will withstand the abuse of moving and sitting directly on the ground. However it is always best to have the bottom board sitting on a stand, pallet, or concrete blocks. This bottom board is very heavy because of the amount of wood that it contains, but the features that it offers outweigh the problems of the "standard" bottom board. The top side rails stop exactly at the edge of the front of the super, so you have some variation in the length of the entrance screen. The front and back cross members are recessed so you have a "hand hold" if you want to lift or tilt the hive. The bottom rails are flush and massive enough to withstand the tension of a ratchet strap. These rails are also recessed to allow the beekeeper to position the ratchet strap once it has passed the cross members. The strap does not come in contact with the truck bed or trailer because of this recess. Many deck screws and water resistant glue is used in assembling the bottom board to assure that it will stay together.

The wood entrance reducer that is available from most bee supply dealers is another piece of the hive that is often misused. It is a ¾" square piece of wood that is 14 5/8" to 14 ¾" long and has two notches in it. It was intended to fit in the front of the hive below the front of the super and on the bottom board when the ¾" side of the bottom board is being used. The clearance and weight of the super holds the entrance reducer in place. When the hive is new or the hive is weak, you may want to reduce the entrance so that fewer guard bees are necessary. If you decide to feed the hive by using a boardman feeder, you may slide it into the large notch and still have room for bees to enter the hive beside the base of the feeder. So the notch is against the floor boards of the bottom board.

However to use the entrance reducer in the same manner in the Fall or Winter could be disastrous. In the fall of the year the reducer is put into a hive to help keep out mice and the notch should be up. The size of the notch used will be determined by the strength of the

Entrance Reducer

An Entrance Guard

hive, usually the large notch is used as the hive should be strong. Often it is too cold for the bees to clean out the dead bees and with the entrance reducer notch in the up position, there is 3/8" space inside the hive that could be used for the dead bees. By the time the front entrance is plugged with dead bees, the cluster has usually moved up in the hive and they can use an upper entrance or ventilation port.

If you choose to use the ¾" opening to the hive during the Winter without using an entrance reducer, you allow the bees a better way to clean out the dead bees when there are warm days. Remember that the bees only heat the cluster by their bodies and not the entire inside of the hive. During the 1900s, some beekeepers used hooked rods to reach in and drag out dead bees.

Other forms of entrance reducers include sliding metal pieces that have notches in them and can be fit to the hive that they are used.

Entrance reducers and entrance guards are different pieces of equipment. Entrance guards usually are made of excluder material and should not be used continually on the hive. There are times that you may consider using one if you have crowded the bees due to comb honey production and don't want the bees to swarm. You may have a special queen in the hive and want to guarantee yourself that she doesn't leave. Many years ago beekeepers used a device called a queen and drone trap on their hives. It had an entrance guard in the lower half of the unit.

A mouse guard is a device that goes on the front of

Entrance Screen

a hive that will prevent mice entering the hive. Again there are different styles of mouse guards from a strip of perforated steel with 5/16 to 3/8" holes to a strip of ¼" hardware cloth.

The difference between a mouse guard and an entrance reducer is that the mouse guard covers the entire entrance of the hive, whereas the entrance reducer restricts the opening. Sometimes the two devices perform the same purpose.

Entrance screens are used by beekeepers that move hives. The older beekeepers may have used a piece of window screen bent in a "V" and wedged into the entrance to keep the bees in the hive. If you didn't have the screen, you could plug the entrance with green grass. When you got to the new location, it was a simple matter to pull out the grass or the "V" screen. If you forgot the grass, it would dry up, turn brown and allow the bees to get out of the hive. I like an entrance screen that screws on to the front of the hive and provides an area for some bees to cool off without plugging up the entrance with bees. You are assured that the bees will stay in the hive and moves of longer distances may be made.

There are several options available to a beekeeper in regards to what type of bottom board and related equipment they could use. It often involves the type of beekeeping activities that are going to be done and the methods of beekeeping that you have been taught. BC

Jim Thompson is a beekeeping historian and collector. See his patent files and other articles on Bee Culture's *new web page, under Thompson's Files.*

GLEANINGS

JULY 2014 • ALL THE NEWS THAT FITS

FLOWERS SMELL BOTH GOOD & BAD

Much like those cute young things decorating a singles bar, flowering plants can adjust their scent bouquet to their needs at any given time and, in this way, attract partner or useful insects in a more targeted manner.

A Swiss-Italian research team says it has found, for instance, that if plants become infested with herbivores such as caterpillars, they attract beneficial insects including parasitic wasps with the help of scent signals from their leaves.

The wasps then lay their eggs in the caterpillars and kill the parasites.

But floral and foliar scents can, however, mutually reduce their attractiveness.

Project leader Florian Schiestl of the University of Zurich says this creates a dilemma for flowering plants – should they use their resources to attract pollinating insects and, by extension, for reproduction or should they invest in defense against herbivores?

Schiestl's team has found the plants have solved their own problem – they adjust their scent bouquet to their needs at any given time and, in this way, attract partner or useful insects when they need them.

The scientists examined the reactions of turnip rape – an edible flowering plant closely related to rape – after its infestation with herbivores. They found the infested plants markedly reduce their floral scent so as to attract parasitic wasps with scent signals from their leaves.

"Decreasing the floral scent makes the plant less attractive to the insects which pollinate it," Schiestl says. "At the same time, it is then more attractive for the parasitic wasps."

After infestation with herbivores and attracting wasps, the plants produce more flowers to compensate for their reduced attractiveness and to attract pollinating insects.

"Floral scents are thus part of a complex trade-off with other scents that likewise attract beneficial insects," Schiestl says.

The results illustrate important ecological interactions when a plant attracts partner insects

Schiestl believes the new findings may be relevant for the organic cultivation of useful plants.

"One could try to optimize the attraction of parasitic wasps with less fragrant varieties and the attraction of pollinators with more fragrant ones," he say. – *Alan Harman*

A turnip rape with a pollinating bumblebee and pest caterpillar. (UZH photo)

ORGANIZE RESEARCH BETTER

The European Food Safety Authority says closer cooperation among European Union agencies, member states and researchers is urgently needed to improve understanding of how multiple stressors damage bee health.

A report published by EFSA proposes that a centralized, open-access research database be created to support the development of a holistic approach to assessing bee stressors. It says several databases have been developed to promote data sharing, but there is no single, publicly accessible repository.

A number of European organizations are involved in research projects related to bee health, but EFSA says their work is sometimes fragmentary and overlapping. Tighter collaboration would help to remove duplication of work, identify research priorities, agree new methodologies and share technological developments, the report says.

EFSA proposes a network that would encompass the European Commission's Bee Interservice Group; the European Reference Laboratory for Bee Health; member state bodies such as the French food safety agency ANSES; other EU agencies such as the European Medicines Agency (EMA); and international organizations.

The network is one of the recommendations made in an EFSA overview of work on bee risk assessment being carried out across the EU. The aim of the report is to highlight knowledge gaps and suggest research that would assist the development of a harmonized environmental risk assessment scheme for bees.

EFSA biologist and bee scientist Agnès Rortais says the EFSA analysis shows there is a lot of research activity related to bee health in Europe, but that it is not always well-balanced across disciplines and there is duplication.

"For example, there is a dearth of work on bees other than honey bees and, even for honey bees, studies have focused only on a few subspecies whereas there is a large diversity with local adaptations in Europe," Rortais says. "There is also a lack of research on reproduction of queens and drones.

"We also noted a scarcity of projects related to the risk assessment of multiple stressors in bees, although we know that in their natural environment bees face a variety of stressors, and we urgently need to improve our understanding of how these factors combine and interact."

Rortais says an important initiative is the dedicated working group recently set up by ANSES to analyze data on the exposure of bees to stressors such as pathogens, pests, pesticides and veterinary medicines, and to review the scientific literature on interactions between these factors.

EFSA is participating in the ANSES group and has also contributed to a workshop organized by the EU Animal Health and Welfare project (ANIHWA), which was set up to increase coordination of national research programs on health and welfare of farm animals, including bees.

"Our analysis tells us that member states and the Commission have been more involved than EFSA in researching the effects of biological stressors on bees, whereas in chemical stressors the roles are reversed," Rortais says. "So it makes sense to combine our relative fields of expertise as we move towards developing an approach for assessing the combined effects of these stressors."

Alan Harman

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THE VETERANS AND WARRIERS TO AGRICULTURE PROJECT

Judge Dan **O'Hanlon**

In March of this year, the West Virginia Legislature passed and the Governor signed a wonderful new program to encourage and support our returning veterans and wounded warriors in finding work and peace in beekeeping and agriculture. House Bill 4439 found that, "in addition to physical wounds, veterans also face other hardships, such as post-traumatic stress disorder, traumatic brain injuries, and other afflictions..."

The legislature went on to find that, "Agriculture offers solitude in its work which, in addition to offering meaningful employment, has been shown to be therapeutic to those suffering from physical and emotional afflictions similar to what veterans face upon returning from combat..." Returning veterans have experienced great difficulties working in industrial settings where there are often loud, unexpected noises, dark halls and corners and too many other people in close proximity. These have all been identified as triggers for PTSD.

As we all know, there is a peace in beekeeping with its solitary pursuits and its close contact with nature. Our Agriculture Commissioner, Walt Helmick, recognized the opportunity of putting veterans on the reclaimed mine land I described in "Plan Bee!" in *Bee Culture*. He hired James McCormick, himself a decorated wounded warrior, to head up this effort. In working on the bill, James persuaded the legislature to recognize that in the agricultural field, "opportunities include...returning post-mine land to an agricultural purpose, expanding the apiculture industry..."

James and State Bee Inspector, Wade Stiltner, found a group of enthusiastic veterans and James found training funds to let Wade begin to teach them to be beekeepers. With the establishment of this Veterans and Warriors Agriculture Fund, West Virginia is well on the way to helping our returning war veterans, our beekeepers and our coal companies to work together for the benefit of all.

"There is tremendous therapeutic value with farming and agriculture," McCormick noted in a story in the Charleston Daily Mail last year. "Watching life blossom, seeing Mother Nature's work and getting hands in the soil are great for these veterans. It gets them out of their homes and agriculture-based therapy is really helping to heal these people."

The subject of that story, Eric Grandon of Clay County, was at an early-March apiary training session at WVDA headquarters. He sees beekeeping as a field that will complement his existing farming efforts, and help him work through some of the issues he has experienced.

"There's nothing like having a sense of responsibility and accountability. What you reap is what you sow," Grandon told the Daily Mail. "Farming has changed my life. My wife sees me like she used to see me. I'm excited again. I have regained my life. I've found my purpose and that is what truly matters to me."

If you are interested in getting this kind of program started in your state, please contact James at **jmccormick@wvda.us.** BC

A copy of the legislation can be found on Bee Culture's *new and improved website to be up and running soon, if not already, on the link at the bottom – From Recent Aticles.*

ONLY GOING TO GET WORSE

The weather pattern that brought winter's curvy jet stream with mild temperature in the west and harsh cold to the east may worsen as Earth's climate warms.

That's the warning from a University of Utah-led study published in the journal Nature Communications that covers the jet stream's behavior over the last 8,000 years.

Geochemist Gabe Bowen, senior author of the study, says if the trend continues, it could contribute to more extreme winter weather events in North America, as experienced this year with warm conditions in California and Alaska and intrusion of cold Arctic air across the eastern U.S.

"A sinuous or curvy Winter jet stream means unusual warmth in the West, drought conditions in part of the West, and abnormally cold Winters in the East and Southeast," says Bowen, an associate professor of geology and geophysics at the University of Utah.

"We saw a good example of extreme wintertime climate that largely fit that pattern this past Winter, although in the typical pattern California often is wetter."

It is not new for scientists to forecast that the warming of Earth's climate due to carbon dioxide, methane and other greenhouse gases already has led to increased weather extremes and will continue to do so.

The new study shows the jet stream pattern that brings North American wintertime weather extremes is millennia old. Bowen calls it a longstanding and persistent pattern of climate variability.

But the results also suggests global warming may enhance the pattern so there will be more frequent or more severe Winter weather extremes or both.

"This is one more reason why we may have more winter extremes in North America, as well as something of a model for what those extremes may look like," Bowen says.

Human-caused climate change is reducing equator-to-pole temperature differences: the atmosphere is warming more at the poles than at the equator. Based on what happened in past millennia, that could make a curvy jet stream even more frequent and-or intense than it is now, he says.

Alan Harman

OBITUARY

Gerald Kress Snapp, 71, of Quincy, FL, passed away March 16 at Bay Care Alliant Hospital in Dunedin. He was born in Logan County, OH on June 28, 1942 to the late Vernon and Mary Kress Snapp. he married the former Carol Ewing in May 2001 and she survives.

Gerald graduated from Riverside High School. he worked for Airstream, was a self-employed beekeeper and worked the Renaissance Festival where he was known as the "Basket Man." He was also a member of Boggs Lodge #292 F&AM.

Over the 40 or more years Gerald owned bees he migrated bees from Ohio - Georgia - Florida - Wisconsin - North and South Dakota and other states.

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MADEWITH-HONEY.COM

In an effort to provide food manufacturers with information about the use of honey as an ingredient in products, the National Honey Board created the **MadeWithHoney.com** interactive websites. These five websites were launched to provide manufacturers with industry-specific technical, marketing and formulation assistance in the areas of baking, beverage, confectionery, dairy and snacking.

The National Honey Board encourages industry members to utilize the information and content found on these websites to say up-to-date on the latest food product trends and innovation, as well as the most recent technical data available.

To find out more about these sites, the National Honey Board encourages you to visit **MadeWithHoney.com.**

www.BakingWithHoney.com
www.BeveragesWithHoney.com
www.CandyWithHoney.com
www.DairyWithHoney.com
www.SnackingWithHoney.com

BEE RESEARCH FUNDED BY BEEKEEPERS

The immunological effects of neonicotinoid insecticide exposure received by honeybee colonies during corn planting is the focus of an Ohio State University research project this growing season. Of particular interest to all beekeepers in the Corn Belt, the research is being funded by the Ohio State Beekeepers Association for $2523. Pictured are Reed Johnson, researcher and assistant professor at Ohio State and Tim Arheit, president of OSBA.

EVERY HONEY EXCEPTIONAL FOR INFECTIONS

American honey could play a larger role in fighting infections to overcome the serious, ever-growing problem of bacterial resistance to medical treatments.

Salve Regina Univ. researcher Susan Meschwitz tells the 247th national meeting of the Amer. Chemical Society in Dallas this is because the unique property of honey lies in its ability to fight infection on multiple levels, making it more difficult for bacteria to develop resistance.

Previously, the commercial use of honey to treat wounds and infections has mainly focused on high-priced nectar harvested in New Zealand from the manuka bush.

Meschwitz, who lead the research team at the in Newport, RI, university, tells *Bee Culture* her team used local honey from different parts of the country for the research, obtaining it straight from beekeepers.

"Some honey samples were filtered and some were not," she says.

Meschwitz says honey uses a combination of weapons, including hydrogen peroxide, acidity, osmotic effect, high sugar concentration and polyphenols – all of which actively kill bacterial cells.

The osmotic effect, which is the result of high sugar concentration in honey, draws water from bacterial cells, dehydrating and killing them.

In addition, she says, several studies show honey inhibits the formation of biofilms, or communities of slimy disease-causing bacteria.

"Honey may also disrupt quorum sensing, which weakens bacterial virulence, rendering the bacteria more susceptible to conventional antibiotics," Meschwitz says.

Quorum sensing is the way bacteria communicate with one another, and may be involved in the formation of biofilms. In certain bacteria, this communication system also controls the release of toxins, which affects the bacteria's pathogenicity, or their ability to cause disease.

Meschwitz says another advantage of honey is that unlike conventional antibiotics, it doesn't target the essential growth processes of bacteria. The problem with this type of targeting, which is the basis of conventional antibiotics, is it results in bacteria building up resistance to the drugs.

Honey is effective because it is filled with healthful polyphenols, or antioxidants, she says.

These include the phenolic acids, caffeic acid, p-coumaric acid and ellagic acid, and many flavonoids.

"Several studies have demonstrated a correlation between the non-peroxide antimicrobial and antioxidant activities of honey and the presence of honey phenolics," she says. "A large number of laboratory and limited clinical studies have confirmed the broad-spectrum antibacterial, antifungal and antiviral properties of honey."

Meschwitz say her team is finding honey has antioxidant properties and is an effective antibacterial.

"We have run standard antioxidant tests on honey to measure the level of antioxidant activity," she says. "We have separated and identified the various antioxidant polyphenol compounds. In our antibacterial studies, we have been testing honey's activity against E. coli, Staphylococcus aureus and Pseudomonas aeruginosa, among others."

Alan Harman

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Friendly, furry, bee-eating spiders live on the tops of the inner covers of my hives. They generally hang out in silky little cocoon-like webs, so they're easy to squash with your thumb or forefinger. The enemy of my friend is my enemy, so that's what I used to do – squash them. Now a kinder, gentler beekeeper just lets them be.

The other day a spider fell off and onto the top bars of a very busy brood super. I thought, "Maybe I can rescue her!" but a worker got right on her, and the two tumbled down between the frames, never to be seen again!

You can be minding your own sweet business, when fate steps in.

My jack-of-many-trades gal Marilyn wrote a freelance piece for the local paper. She described shipping bees to California to pollinate the almonds. She interviewed Lyle, Paul and me. Lyle's an almond bee broker and well-known commercial beekeeper. Paul's a commercial beekeeper down the road. This was not Pulitzer stuff - just an informative article in the Glenwood Springs Post Independent about the almond pollination business, with a local angle.

I thought that was the end of it, but then that story got legs. Soon thereafter, a couple of beekeeping friends sent me copies of an online blog about bees and neonicotinoids, the systemic insecticides widely blamed for increasing honey bee losses. The role of the "neonics" in bee mortality is controversial, with some of the best and the brightest in the bee world at odds.

Let me state for the record that I have no opinion on this matter. I'm not ducking the issue. I simply don't know the answer.

The blogger is not a bee scientist. He's an anti-environmentalist and right-wing think tank guy, so he's an expert on everything! But he argues, perhaps persuasively to the uninitiated, that the reason for bee losses is everything but the neonics, and to back him up he quotes Lyle, my gal Marilyn, and me! Imagine that!

It sounds as if he interviewed Lyle on the phone, but all he did was lift a quote from Marilyn's story about the 1.5 million beehives it takes to pollinate the California almond crop.

He quotes me, also from Marilyn's story, saying that bees come back from California "loaded with mites and every other disease you can think of." I guess I did say that.

Then he quotes Marilyn – again, as if he'd just interviewed her, talking about truck-ride stresses on bees traveling to and from California.

These are his experts. This was shoddy, copycat journalism, to be sure, but it unexpectedly made me a player in the neonicotinoid controversy. Shipping bees to the almonds can be a problem for honey bees – I'd said so myself! – so I was now an expert witness for the defense of the neonics!

Sure enough, a week later, the Ag PhD show on Sirius XM Rural Radio channel 80 radio called. They wanted to know if I could go on the air later that day, to talk about bees in the almonds. It was to be a three-minute slot. Now why would anyone consider me an expert on pollinating almonds? Oh, and they said I'd be on the air with somebody from Bayer. My first reaction was panic. Would this turn into a debate? I felt like the quarterback for one of those small-school football teams about to get fed to the Nebraska Cornhuskers for a pre-season taste of blood. I gulped and said yes.

I called my *Bee Culture* editor Kim Flottum, who is wiser and less impetuous than I. I said, "Kim, I'm not going to be a Monsanto/Bayer shill. What do I do?" He said, "Tell them there are three factors that all bee scientists agree are leading to the decline of honey bees: *Varroa* mites and associated diseases, poor or insufficient nutrition, and agricultural pesticides. Don't even mention the neonics."

The show was an hour-long Corn Belt farm special on bees. The moderators: brothers Darren and Brian, who grew up in South Dakota raising corn, wheat, and soybeans. They confessed to knowing just about nothing about honey bees. The gist of the program was that neonicotinoid seed treatments were not a threat to honey bees. The culprits were *Varroa* mites and every other problem we beekeepers face. This was a loaded deck, with on-air "experts" from Bayer and big-ag-friendly universities. Just about everybody agreed that all approved agricultural pesticides, when applied according to label directions, would not harm honey bees. There was some good information presented, but it felt more like a political rally than an educational program.

I got interviewed on my own – not with anybody from Bayer, after all – for about 10 minutes. I explained how I make money from honey, crop pollination and pollen sales. I emphasized the need for cooperation between growers and beekeepers. I didn't dwell on California, and I hit them with Kim's three factors leading to bee decline. They gasped and said it never occurred to them that poor diet might be a problem for bees. They didn't respond to my remarks about pesticides, but at least I got in my licks. They were very polite. The irony is that I want the Corn Belt guys to be right. I want the neonics to be our salvation, not our death knell. I want the neonics to reduce the need for cover sprays, without killing our little darlings. But you can't always get what you want. I'm old enough to remember Big Tobacco feeding us the Big Lie. Money and self-interest always justify themselves.

Ed **Colby**

A Story With Legs