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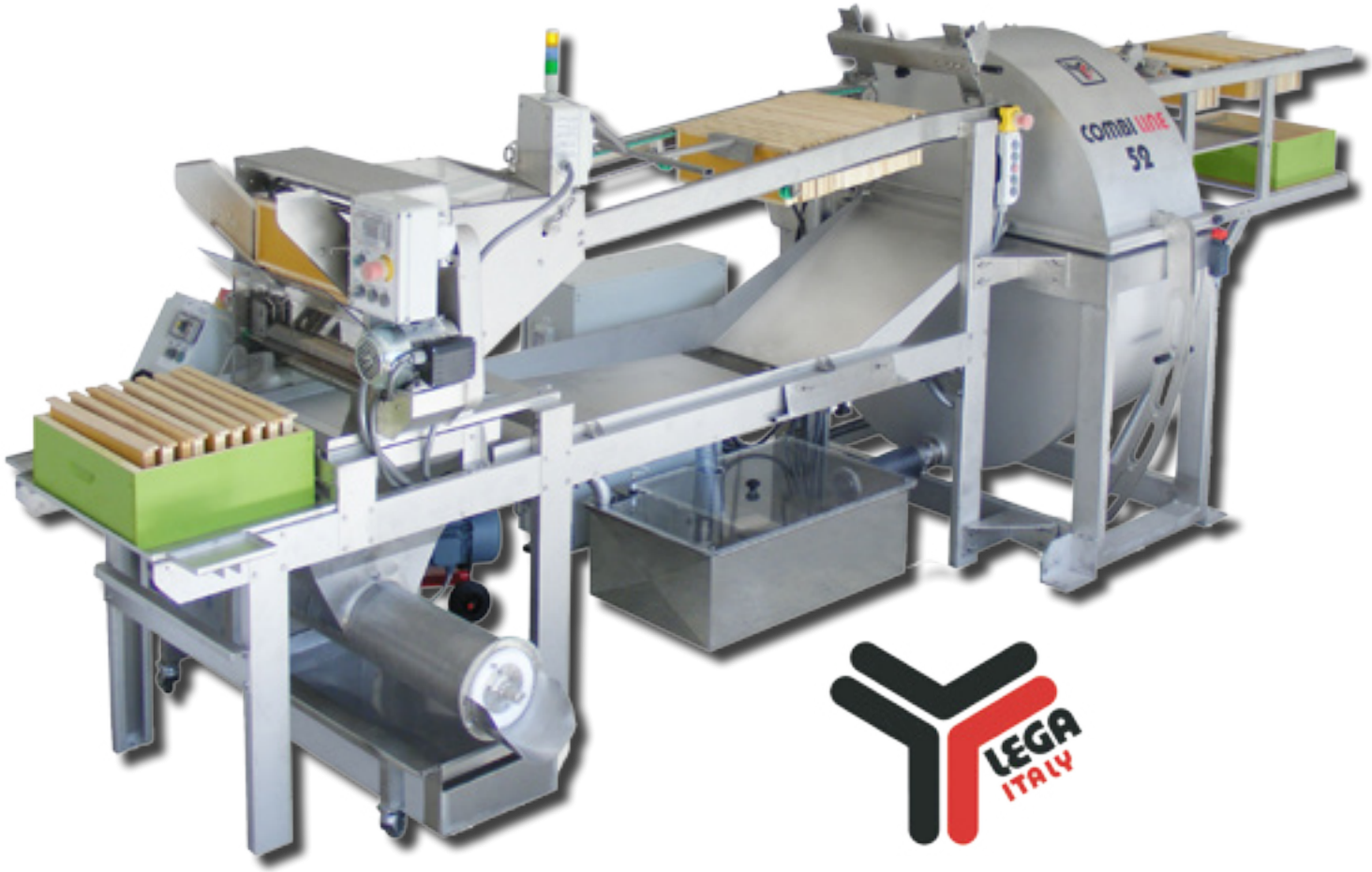

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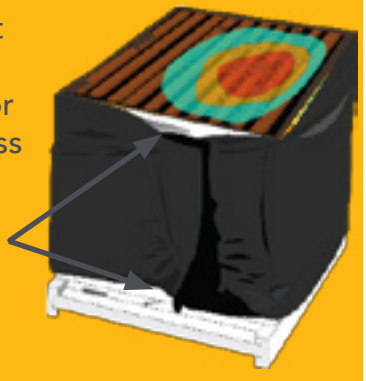

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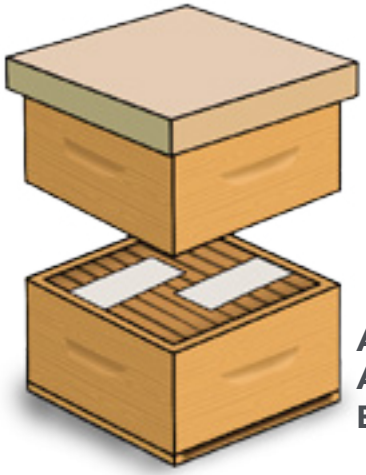

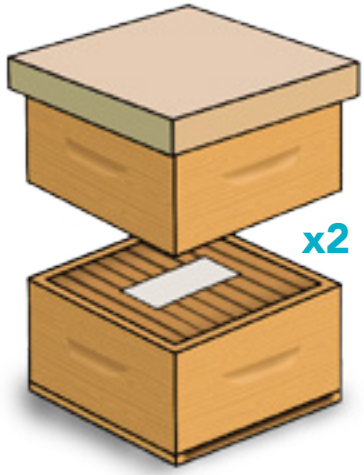

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Bee Culture

February Features . . .

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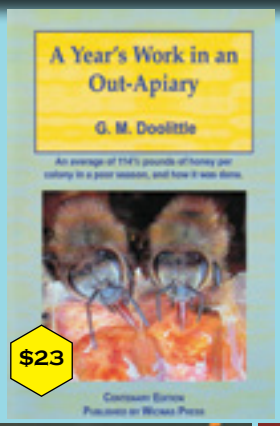

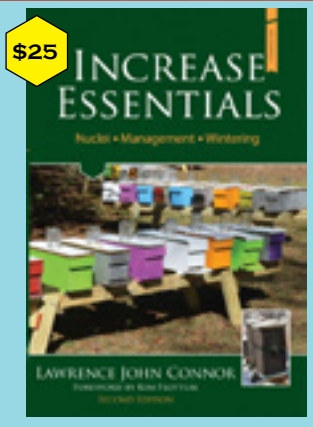

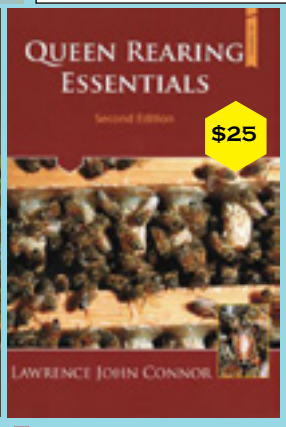

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Brexit Thoughts

There are always two ways at looking at things. The same is true of Brexit. We do not have Small Hive Beetle (SHB) in the UK at the moment. Under European Law we cannot ban imports from Italy where they have had SHB for at least three years. What would your American readers give to turn back the clock to a time when there was no SHB.

Did we learn nothing from importing *Varroa* from Europe? Many people implored the government to ban imports at that time but our hands were tied through EU Law. In came *Varroa*.

As far as research funding goes I'm quite sure we put more money into the European education pot than most other countries. That money will now be delivered direct to the universities (should we ever manage to leave Europe's clutches!). British Universities made a name for themselves long before we joined the EU.

Talking about universities in general, in the last 30 years or so "universities" have proliferated. Every college that used to deliver very worthwhile education to those less academically gifted in areas in the UK we call trades (plumbing, equestrian skills, shipbuilding, beauty etc) turned itself into a university.

I believe we need to turn the clock back. If some of these new "universities" go to the wall it will be because the market will not sustain them.

Incidentally a great magazine folks, I look forward to reading my issue each month on my IPad.

Jackie Elliott
Editor *Scottish Beekeeper Magazine*

Plant More Plants

One of the main reasons I assist and encourage people to start beekeeping is the hope that they will increase the amount of planting for pollinators they do on their property. Much like feeding a pet, people plant pollinator-friendly species in order to provide forage for their honeybees. In doing so, however, important native species that largely go under the radar are provided for, too. Native bees don't provide people with delicious honey, and the Milkweed assassin bug, for example, which preys on these bees and other pollinators, is downright ugly! Convincing people to help such a species would be a hard sell, but convincing them to protect honey bees and share in their delicious crop is a walk in the park.

What I hadn't considered was the possibility for the hive itself to act as a focal point for various species' interactions. Other than the obvious, and undesirable, pests and parasites that take up residence in the hive, I was surprised at how many other creatures found a use for it. Green anole lizards hanging out on top of the hive, gobbling up earwigs as they scuttled across the damp wood; spiders making webs across the legs of the hive, as well as others taking up residence in nooks of the wooden hive body; snakes warming themselves on the concrete slabs I placed under the hive to discourage small hive beetle propagation (whether that works or not!); birds feeding on dead bees pushed out of the hive as part of the living bees' house-cleaning behavior; and even mud-dauber wasps making their adobe homes on a quiet side of the hive.

What set these apart from the interactions we beekeepers more often talk (and complain) about was that they posed no threat to the hive and some may even be seen as beneficial. More than that though, the simple joy of not knowing what you'll see when you go out for a hive check, or what they'll be using your hive for this time, is just one more, slightly unexpected, reason to love being a beekeeper.

Peter Keilty

Young Minds At Work

Bee populations are decreasing. Why?

Because their habitat is being destroyed.

There are many other problems such as pesticides, but through research we discovered the biggest problem is the bee's habitat loss. Some existing solutions include bee hives which provides a safe home for the bees to produce honey. The downside of this solution is, if you live in a neighborhood, having a hive might not even be an option.

Bee Culture

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Medina, OH 44256
mailbox@beeculture.com

Allergies and rejections from neighbors could prevent you from having a hive.

One option is the Easy Bee Garden Growth Kit, our team created. It includes a small biodegradable cup with seeds, fertilizer, and soil already in it. All you have to do is take off the lid, place it in the ground, and water it. Wildflowers such as Baby's-breath, Clover, and Dandelions will bloom and create a place where bees and other animals such as butterflies would be attracted.

Another option is a bag of seeds, soil, and fertilizer, but instead off planting it into the ground, you can sprinkle it onto the ground.

We hope our Easy Bee Garden Growth Kit will inspire others to create innovative products to increase habitat for insects, especially bees.

These products are not for sale, but could be if there is enough demand. They were created as a research project our robotics team did for a competition in the First Lego League (firstinspires.org).

Emma Lykins
Loveland, OH

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Scott Derrick of Blythewood Bee Company worked in the fragrance and flavor manufacturing world for 18 years prior to becoming involved in beekeeping. "I've used the standard vials of swarm attractant before and found them substandard. I knew I could do better."

Swarm Commander Premium Swarm Lure comes in various forms. The most popular is the two-ounce spray bottle sells for $29.95. Derrick says you should only spray two sprays on the bottom of your inner cover and one on the entrance every seven to 10 day for maximum effectiveness. The directions should be followed closely. Spraying too much in the hive can have the opposite effect and repel the bees from entering the hive. "Some people have put too much in the bait hive thinking it would help. It doesn't. The swarm will mount under the bait hive."

You can purchase Swarm Commander Super Lure from Blythewood Bee Company at **www.blythewoodbeecompany.com**. You can also call their retail store at 803-754-7577 or email **Derrick at contact@blythewoodbeecompany.com**.

ProVap 110 – Sideliner/Commercial Oxalic Acid Vaporizer

Finally, a ***FAST*** Sideliner/commercial Vaporizer at a reasonable price! We're talking 20 seconds per hive. No wand to insert, just point and shoot. No guessing on dosage. No compressor or battery. Just plug it into an inexpensive inverter, generator or use house current. It's 110 volts, 2.2 watts. This is the one you've waited for and now it's here!

Operation

This vaporizer is most easily used from the back of the hive, where a small (1/4") hole is drilled (3-4 inches up from the center of the bottom of the brood box) to accommodate the vaporizer stem. However, you can use it in the front entrances as well. Using a hole in the back of the hive (we believe) is easiest as it eliminates the nuisance of flying bees. The friction between the stem and drilled hole holds the vaporizer in place during vaporization, which allows you time to prepare the next dose. The bees will readily propolize this small hole. To vaporize from the front of the hive, simply take a paint stick, cut it to the desired length and drill a ¼" hole in the center of the paint stick. Slide the stick over the stem and you have an effective vapor block. Connect the vaporizer to your 110 volt power source. It will take approximately 2 minutes to reach operating temperature. The red sequence readout will display 230 when ready.

In the white plastic lids (recess side up) place the appropriate amount of OA. Do NOT pack the OA in the lid; rather place it loosely. Use one gram per brood chamber no matter the size be it mediums or deeps, eight or ten frame. Use ½ gram on a nuc. One gram is almost ¼ teaspoon, so on a two brood chamber hive; you would use ½ a teaspoon. Invert the vaporizer. Take the white plastic lid containing the OA and push it onto the bowl (be careful the vaporizer bowl is very HOT!) Place the still inverted vaporizer stem (with lid attached) into the drilled hole then turn the vaporizer right side up and tap the lid. The acid will fall into the bowl and start to vaporize. This will cause the temperature to drop to approximately 210-215 then very quickly start to rise. When it again reaches 230, it is finished vaporizing and you can move on to the next hive. This will take approximately 20 seconds! You need to seal any openings during and 10 minutes after vaporization.

Safety!

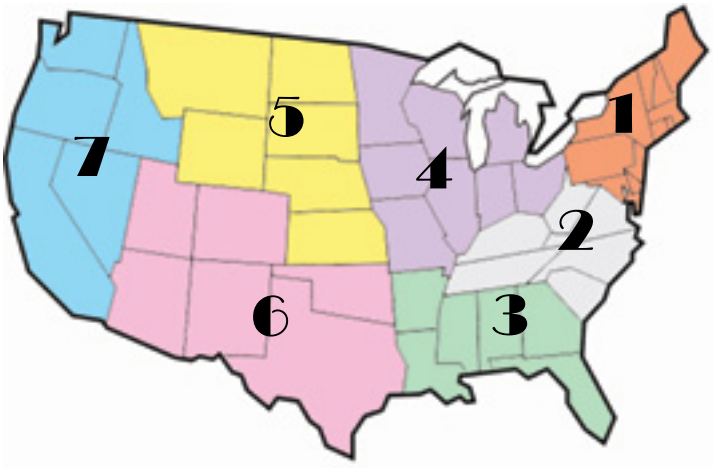
You must use a respirator that is rated for organic acids! Make sure you buy one with replaceable filters. You are going to work in a heavy OA environment. Heavy, heat resistant gauntlet gloves are a must as well.

Want to see it in action?

www.youtube.com/watch?v=yYl63Akou3E

Price: $485.00. Visit **www.OxaVap.com**.

FEBRUARY – REGIONAL HONEY PRICE REPORT



What Do They Sell?

What do our reporters sell, you ask? Well, take a look at the chart below. This is the 7th year we've done this so the patterns are fairly predictable, but over the years we have had reporter turnovers, business expansions and contractions, droughts and other things…it's an always changing world out there, and to a degree this shows that. For instance and for starters, the percent selling candles this year is the lowest ever. Not by much, but fewer than a third are selling candles. Has the market changed, is wax difficult to get because of a poor honey crop? Well, take a look at bulk wax sellers, that's wholesale lots – way down this year, as are retail sellers, that is wax blocks. Something's going on with beeswax this year it seems. A couple of months ago I discussed the new dynamic in the bee business was raising bees for those who were pollinating. But that doesn't seem to be the direction for this group of reporters, looking at those who sell queens, packages, nucs or supplies. So what's going on?

If there's no wax, what about honey? You have to have honey to make wax, so looking there tells us…Drat! We changed that category this year to make it a little more clear, and of course it doesn't tell us what we want to know. Yet. For the past 6 years we've asked about selling 'liquid' honey, along with comb, cremed and chunk. This year, we broke that liquid figure into retail, wholesale', and bulk sales, to get a better picture of the type of sales our reporters are making. Some, of course sell all three. Our survey asks more questions than we show here, but this time we think we should share some of this. 21% sell some of their honey bulk, along with some retail sales (7%), wholesale (2%), and all three (12%). Only 3% are wholesale only, but 37% are both wholesale and retail, 12% are wholesale, retail and bulk. 35% are strictly retail, but 72% are retail and wholesale, and 79% are wholesale, retail and bulk sales, while fully 91% do some of all of these. Overall, this comes to 21% sell bulk, 91% sell retail and 54% sell wholesale. Considering that we only produce 20% of the honey we consume that is measured by some government agency somewhere and isn't captured in home, farm market or work sales…they are missing, a guess here maybe, just under half of the honey produced in the U.S. that is sold in the U.S. That changes how we should look at U. S. honey consumption. Is the amount we consume that's produced here actually double what we've been figuring?

	Candles	Ornaments	Wax Blocks	Honey Stix	Pollen	Propolis	Bee Supplies	Packages	Queens	Bulk Wax	Lotions	Soap	Creme Honey	Honey Retail	Comb Honey	Chunk Honey	Nucs	Pollination	Honey, Wholesale	Other
% Reporters Selling																				
2010	28	17	54	28	28	13	20	9	15	48	20	10	35	90	66	38	28	-	-	-
2011	39	20	53	39	35	21	21	10	15	42	19	11	35	90	67	40	26	37	-	18
2012	35	21	53	37	32	15	53	10	22	44	18	13	21	94	62	34	23	32	-	48
2014	32	12	51	30	31	21	55	17	27	42	25	10	29	93	54	42	29	34	-	11
2015	30	14	56	28	32	17	40	15	27	40	17	5	30	90	62	38	32	33	-	6
2016	35	14	62	26	30	16	44	15	26	47	22	14	36	94	55	34	31	33	-	6
2017	27	13	52	27	25	12	36	13	20	30	22	13	27	83	48	40	28	23	52	8

	REPORTING REGIONS 1	2	3	4	5	6	7	SUMMARY Range	Avg.	$/lb	History Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS												
55 Gal. Drum, Light	2.61	2.03	2.12	2.78	2.61	2.00	2.40	1.98-3.90	2.29	2.29	2.23	2.20
55 Gal. Drum, Ambr	2.42	1.98	2.05	2.44	2.42	1.89	2.40	1.70-3.65	2.17	2.17	2.12	2.08
60# Light (retail)	224.00	195.00	199.00	199.40	222.48	202.50	266.67	162.00-300.00	213.95	3.57	209.14	204.84
60# Amber (retail)	225.00	191.67	194.00	196.40	217.76	187.50	260.00	150.00-300.00	210.52	3.51	209.41	204.35
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	96.08	78.00	86.80	57.00	84.42	84.42	95.00	40.00-126.00	85.85	7.15	86.99	83.82
1# 24/case	130.41	108.50	125.30	105.63	148.00	140.75	147.47	84.00-230.00	124.50	5.19	122.04	119.04
2# 12/case	115.58	95.50	108.45	98.04	119.79	119.79	147.00	78.00-180.00	110.58	4.61	108.45	106.11
12.oz. Plas. 24/cs	110.88	78.67	90.50	89.57	114.87	114.87	126.60	66.00-192.00	100.75	5.60	96.59	97.15
5# 6/case	137.98	106.00	98.00	102.92	129.86	129.86	180.00	71.50-204.00	121.96	4.07	120.99	119.11
Quarts 12/case	176.00	127.50	134.51	134.30	185.00	163.25	196.00	109.20-240.00	151.91	4.22	142.11	138.22
Pints 12/case	102.00	81.50	77.67	108.50	111.00	166.00	106.00	60.00-166.00	98.20	5.46	91.98	91.32
RETAIL SHELF PRICES												
1/2#	4.88	4.17	4.50	3.80	5.00	4.50	6.50	2.90-7.00	4.79	9.59	4.84	4.49
12 oz. Plastic	5.75	4.52	4.92	5.56	4.76	7.95	7.40	3.25-9.50	5.77	7.70	5.98	5.43
1# Glass/Plastic	7.39	6.61	7.45	6.97	6.18	9.00	10.53	4.00-12.69	7.71	7.71	7.57	6.98
2# Glass/Plastic	12.89	11.03	12.23	12.08	10.43	17.00	17.17	7.50-21.50	12.73	6.37	12.26	12.16
Pint	15.00	8.64	7.80	13.85	9.17	14.38	11.86	5.00-17.70	10.66	7.10	10.54	9.65
Quart	20.04	15.28	14.33	18.75	16.50	25.00	21.00	9.25-32.79	17.92	5.97	17.38	15.92
5# Glass/Plastic	20.04	15.28	14.33	18.75	16.50	25.00	21.00	9.25-32.79	17.92	5.97	27.03	26.45
1# Cream	9.03	8.75	11.25	6.63	7.61	9.32	11.00	6.00-13.50	8.90	8.90	9.13	8.56
1# Cut Comb	12.67	9.13	9.00	9.88	7.50	12.64	15.33	6.00-22.00	11.27	11.27	10.83	10.79
Ross Round	8.85	6.80	8.72	9.00	8.72	8.72	9.47	6.00-11.70	8.59	11.45	10.53	9.92
Wholesale Wax (Lt)	6.87	4.83	5.75	6.35	6.36	6.36	6.75	3.00-10.00	6.22	-	6.13	6.04
Wholesale Wax (Dk)	7.03	4.58	4.28	6.35	6.14	6.14	5.25	2.85-10.00	5.85	-	5.60	5.23
Pollination Fee/Col.	100.83	67.50	67.50	77.00	80.00	106.32	108.33	50.00-200.00	87.63	-	87.20	81.57

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COST OF POLLINATION – 2016

Kim **Flottum**

USDA NASS released their 2016 Value Of Pollination report in December last year. Below are excerpts from the report detailing what crops were monitored, which states are in the regions they detailed and definitions of categories used, along with a chart compiled here showing the relative value of the various categories of crops pollinated. The entire report is available at the link: **http://usda.mannlib.cornell.edu/usda/current/CostPoll/CostPoll-12-22-2016.pdf**

We've already heard discussions on the accuracy of some aspects of this report, but it is brand new, and in our opinion, NASS is to be congratulated on gathering this data and making it available for industry use.

Blueberries had the highest total value of pollination of crops reported in Region 1 during in 2016. The price per colony for blueberries decreased 7 percent to 88.2 dollars per colony in 2016. The price per acre decreased 12 percent to 147 dollars per acre. The total value of pollination for blueberries in Region 1 for 2016 was 5.73 million dollars. The total value for pollination of all crops in Region 1 for 2016 was 18.5 million dollars, down 2 percent from a year ago.

Blueberries had the highest total value of pollination of crops reported in Region 2 2016. The price per colony for blueberries increased 6 percent to 53.7 dollars per colony in 2016. The price per acre increased 6 percent to 81.8 dollars per acre. The total value of pollination for blueberries in Region 2 for 2016 was 1.77 million dollars. The total value of pollination of all crops in Region 2 for 2016 was 5.12 million dollars, down 2 percent from previous year.

Watermelons had the highest total value of pollination of crops reported in Region 3 during in 2016. The price per colony for watermelons decreased 3 percent to 58.7 dollars per colony in 2016. The price per acre increased 23 percent to 59.5 dollars per acre. The total value of pollination for watermelons in Region 3 for 2016 was 1.82 million dollars. The total value of pollination of all crops in Region 3 for 2016 was 4.71 million dollars, down 13 percent from last year.

Pumpkins had the highest total value of pollination of crops reported in Region 4 during 2016. The price per colony for pumpkins was 80.3 dollars per colony in 2016. The price per acre was 26.7 dollars per acre. Pumpkin estimates for 2015 were not published, so no comparison can be made with the previous year. The total value of pollination for pumpkins in Region 4 for 2016 was 201 thousand dollars. The total value of pollination of all crops in Region 4 for 2016 was 2.51 million dollars, up 30 percent from a year ago.

In Region 6 & 7, the average cost per colony for almonds increased 1 percent from 165 dollars per colony to 167 dollars per colony in 2016. The average price per acre, however, decreased from 313 dollars per acre to 287 dollars per acre during that period. The total value of pollination for almonds decreased 3 percent due to less colonies used on almonds in 2016. Almonds were the highest valued crop in that region. The total value of all pollination in Region 6 & 7 for 2016 was 309 million dollars, up slightly from last year.

Apples had the highest total value of pollination of crops reported in Region 5 during in 2016. The price per colony for apples decreased 2 percent to 51.5 dollars per colony in 2016. The price per acre increased 5 percent to 47.6 dollars per acre. The total value of pollination for apples in Region 5 for 2016 was 5.41 million dollars. The total value of pollination of all crops in Region 5 for 2016 was 14.7 million dollars, up 7 percent from previous year.

To improve the reliability and increase the number of estimates which can be published, estimates are published at regional level, based on the regions used for the 2012 Census of Agriculture. Regions 6 and 7 were combined. The states in each region are as follows:

Region 1: Connecticut, Illinois, Indiana, Iowa, Kansas, Massachusetts, Maine, Michigan, Nebraska, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Wisconsin.

Region 2: Alabama, Delaware, Georgia, Kentucky, Maryland, North Carolina, South Carolina, Tennessee, Virginia, West Virginia.

Region 3: Arkansas, Florida, Louisiana, Missouri, Mississippi, New Mexico, Oklahoma, Texas.

Region 4: Colorado, Minnesota, Montana, Nevada, North Dakota, South Dakota, Utah, Wyoming.

Region 5: Alaska, Idaho, Oregon, Washington.

Region 6 & 7: Arizona, California, Hawaii.

Terms and Definitions of Cost of Pollination Estimates Paid Pollinated Acres: Acreage that an operation paid money to be pollinated by honey bees.

Dollars per Acre: The average price paid by operations to pollinate

Cost of Pollination By Region – 2016
(x millions of dollars)

Region	1	2	3	4	5	6&7	Total
Tree Nuts	-	-	-	-	-	280.5	280.5
Tree Fruit	4.2	.4	.3	.3	10.1	11.1	26.4
Citrus	-	-	.6	-	-	1.1	1.7
Other Fruit	-	-	-	-	-	1	1.0
Melons	.3	1.2	2		.3	3.3	7.0
Berries	10.9	1.8	.4	-	2.5	3	18.6
Veggies	2.3	1.2	.8	.2	.4	.5	5.4
Other	-	-	-	-	.8	6.9	7.7
All Other	.9	.4	.6	2.0	.4	1.2	5.5
Total	18.5	5.12	4.71	2.51	14.7	308.6	354.1

an acre of crop. Acres pollinated for free or on a nonmonetary basis were not included in this calculation.

Colonies Used: The total colonies used to pollinate a crop; regardless of ownership or if on a paid basis.

Dollars per Colony: The average price paid by operations to use a colony for pollination. Colonies owned by the operation or used on a non-monetary basis were not included.

Total Value of Pollination: The total valuation of all pollination, calculated by multiplying the price per colony by colonies used.

Included Crops Sampled Crops:

Tree nuts – Almonds, Macadamia nuts

Tree fruit – Apples, Avocados, Cherries, Mangos, Peaches, Pears, Plums, Prunes

Citrus – Nectarines, Oranges

Other fruit - Grapes, Kiwi

Melons - Cantaloupes, Honeydew, Watermelons

Berries - Blueberries, Boysenberries, Cranberries, Raspberries, Strawberries

Vegetables - Cucumber, Pumpkins, Squash, Turnips

Other Crops - Alfalfa, Buckwheat, Canola, Clover, Sunflowers

Additional Crops: Tree nuts - Chestnuts, Hazelnuts, Pecans, Pistachios, Walnuts, Tree fruit - Bananas, Papayas, Persimmons, Pomegranates, Citrus - Grapefruit, Lemons, Limes, Kumquats, Mandarins, Tangelos, Tangerines, Other fruit - Pineapples, Berries, Currants, Loganberries, Vegetables - Artichokes, Asparagus, Beets, Broccoli, Brussel sprouts, Cabbage, Carrots, Cauliflower, Celery, Eggplant, Garlic, Kale, Lettuce, Lima beans, Okra, Peas, Peppers, Potatoes, Snap beans, Spinach, Other Crops - Barley, Beans, Coffee, Cotton, Hops, Oats, Peanuts, Sorghum, Soybeans, Tobacco. BC

INNER COVER

Before I say anything else, I have to tell you a little about Yvonne Crimbring the Editor of The Pennsylvania Beekeeper, the newsletter of the Pennsylvania State Beekeepers Association. I can relate to being an editor of a State Beekeeper's newsletter. I was part of the Connecticut State Beekeepers Association Newsletter for a time, and then the Ohio State Beekeepers newsletter for a time, and the EAS newsletter for a time, and I did a Master Gardner's newsletter for a time, and a beekeeping museum newsletter for a time, too. And I still get to do this newsletter every month, and recently, the BEEKeeping newsletter on a quarterly basis, too. I have a feel for getting out a publication. But I don't hold a candle to Yvonne.

Forty two years she's been at this, since 1974 (and even before that as an assistant to the then editor). Back then it was 18 pages, but 24 now, with two thirds of those pages filled with over 30 advertisers. The rest filled with the news of PA beekeeping, the fair, the queens, editorials and national news, plus a recipe every now and then. Plus, she's also the Sec/Treas of the Association so that fills the rest of her day. She has a Mac instead of that manual typewriter now, but she still uses a hand-written card file to keep member records, and has some help from a very understanding husband, and a talented daughter.

So I've been reading her newsletter as long as I've been here. It's not the fanciest NL that comes across my desk, but it's as regular as clockwork, always has good stuff, is easy to read and does what it's supposed to do for a newsletter. Yvonne, I don't know how you managed this all these years, but from one old editor to one very good editor, Congrats on a stunning career. Take a bow, and put your feet up. You deserve it.

•

I was mulling over some of the information from the meeting in Columbus in November, trying to distill the best of what I heard from the most people to get a clearer picture, and perhaps a better take-home message from all that I'd heard. Then, I was talking to a commercial queen producer this week, and he pretty much summed up all that I heard in a tidy little package.

His bees do just fine, he said, when he was able to keep them at least three miles from any other beekeeper. Isolation is the best mite treatment you can use he said.

"When I have my bees making honey, far from anybody else, they do just fine. Mite loads either don't build, or build so slowly I can relax for a bit," he said.

"The biggest problem we have with mites isn't that there are no effective treatments, though that is going to be a problem pretty soon when the active ingredient amitraz hits the resistant wall and there's nothing economical in the box anymore. No, the biggest problem is when your neighbor doesn't take care of his bees, they crash, and then you get his mites, his viruses, his problems", he said.

That's the problem. Pure and simple. At the November meeting one of the commercial beekeepers said that you know which yards will give you problems all season long, and which won't. It's because of your neighbors.

But back to that queen producer. Believe it or not we were talking about the weather, and I mentioned that the day after Christmas it was 60F here in Ohio and I was able to do some mite tests. I tested four colonies, 300 bees/test. That's 1200 bees, give or take. In all that, two mites. Two. They were your queens I told him, because they were. He didn't hesitate a nanosecond and said I must be in some real isolated location. He went on to say that it was good to hear his bees were doing well, but nobody's bees did that well unless the beeyard was well isolated.

So I keep hearing that again and again and again. You are your neighbor's beekeeper. Take care of your bees. Plain and simple.

•

Added Sugar.

Added Sugar.

New label laws take effect soon, some sooner than others. Added sugar on a food label is going to be a reality. Sooooo....how much sugar is added sugar in a jar of honey? Some of it? All of it? Any of it? None of it? Well, let's talk about sugar.

A couple years ago I read a book entitled *Salt, Sugar, Fat*, by Michael Moss. I'm smart enough to know a tiny bit about diet, and I thought I knew something about these three evils. But I didn't really have a clue. It changed the way I ate, immediately, and I've become a fanatic about reading labels. I spend more time doing that in a grocery store now than actually putting things in the cart. And I shop a lot. Grew up in a grocery store so have always liked to explore and learn how different folks market food.

Recently a new book made a splash even before it was published, so I pre-ordered and waited. It pretty much lived up to the pre-published hype it got because it's on a topic people want to hate, by an author with a reputation for uncovering evils in our diet. It's a block buster when it comes to what's killing us. And Big Sugar is one of the worst. Along, of course, with big food (read chicken, beef and pork here), big chemical (pesticides), big tobacco, big energy (oil and gas and coal), big auto – pretty much, if you're big anything anymore you're one of the bad guys. It's what goes with all the money they make I guess.

The first book I read talked about the sugar industry some, but more about what sugar is doing to your body. This One, *The Case Against Sugar*, by Gary Taubes, talks more about the industry's efforts to keep people thinking that what is killing them was – first, calories, (there's only 16 in a spoonful of sugar), then it moved on to saturated fat that caused obesity and heart disease. See, sugar is really OK. The American Heart Association really played up the fat thing – that and cholesterol were the culprits for all of our health problems, for awhile.

Then along came HFCS. That's sugar, really. But it got a pass from the doctor people who said it was actually OK for diabetics. Really! The processed food folks had a new alibi. So they cut the 'sugar', and they cut the 'fat' and they added HFCS to make that low-fat things like low-fat yogurt – how could that be bad for you? They claimed the calories came from HFCS, not sugar!

So now where are we? Suffering from something called "metabolic syndrome", the greatest predictor of heart disease and diabetes. Signs of the syndrome? Obesity, high blood pressure and insulin resistance. Cause? According to the author – Sugar.

The problem is – if we removed sugar completely from our diet, we'd still be sick. We've poisoned our environment, we eat too much and exercise too little, we smoke, we drink, we have bad genes. Follow the precautionary principle he suggests. And eat less sugar. And I'll add eat less fat and less salt, too.

But back to the changing label. What exactly is added sugar in a processed food? Here's what I understand about some of it anyway.

I've heard the National Honey Board and others are weighing in on this, but consider this.

Take a quart of fresh squeezed grape juice. It has water, natural flavors and some sugar in it. Let's say, 20 grams of sugar from the grapes. Then, you concentrate that quart of juice for preservation and storage to a quarter cup of juice. It's still got all the sugar, all the flavor, just less water. Then, you reconstitute that quarter cup to a half quart of juice, put it in a plastic bottle and call it Grape Juice. It still has all the sugar of that full quart, all the flavor, just less water. So, if it had 20 grams of sugar per quart, now it has 20 grams of sugar per half quart. It should, really, only have 10 grams because that's what real grape juice has. But it has 20. That extra 10 grams of sugar is, Ta-Da – "Added Sugar".

Another way to look at this is if you simply add sugar, or HFCS or almost anything that ends in –ose (maltose, dextrose, natural sugar, natural flavors, etc), over and above what the food contains in an ummm, natural state, you have "added sugar" to the end product.

So, as I see it. Honey has no "Added Sugar". When it comes out of the extractor it's about 80% sugar, and 20% water, give or take. If it goes in a jar and is put on a shelf, it has …no… added sugar.

Now, if some Bozo takes a quart of that honey and adds HFCS to it to add volume, and sugar, so it is now two quarts of "Sweetener" (it is no longer honey), it has "Added Sugar", right? Right.

If a manufacturer takes some of that honey and adds it to a bread recipe, or a BBQ sauce, or a salad dressing, or kid's cereal (Breakfast candy as it's referred to in that industry), then, that honey becomes added sugar, just like HFCS or cane sugar, or maltose, or natural grape flavors.

But in a jar, straight out of the extractor, there is only naturally occurring sugars in a jar of honey, just like that grape juice, like apple juice, like milk or like sour cream.

I'm not positive when that label thing begins, but it's already being talked about, so stay tuned. At some point, added sugar is going to become another fact of life for food folks. But I don't think it will for beekeepers. Keep a good thought. But pay attention.

•

Did you take a look at our monthly Honey Report yet? A couple of things came up that sort of surprised me. One was beeswax. Or actually, the number of our reporters that are dealing with beeswax. I talked a bit ago about the gradual change in perspective of a good number of commercial beekeepers toward producing honey. A significant number are reducing the energy they put into producing honey and are instead producing more bees. These they use to sell to the increasing number of beekeepers who are pollinating for a big chunk of their income. That makes sense. You go where the money is. And there's not a ton of money in bulk honey sales at the moment (can you make a living selling honey in drums for an average price of less than $2.25 a pound?). Low cost imports are taking more and more of the market in this country, so what's a beekeeper to do? Make more bees, and less honey, that's what. So – making less honey produces less wax, right? Pollinating crops makes no beeswax at all, right?

I know that some are still trading wax for equipment with some of the suppliers, and the suppliers are using this wax, mostly, for foundation. But the future of beeswax foundation is a foregone conclusion. There isn't a gram of the stuff in this country that doesn't contain some amount of poison. And putting poison in a beehive isn't a very good idea. Putting plastic foundation, or no foundation at all in a beehive is a better idea. Let the bees build the comb, and then get rid of even that because of environmental pollution and poison after a couple of years. I know, the most valuable piece of beekeeping equipment used to be a frame of drawn comb. Not any more. Change is hard, all over the map.

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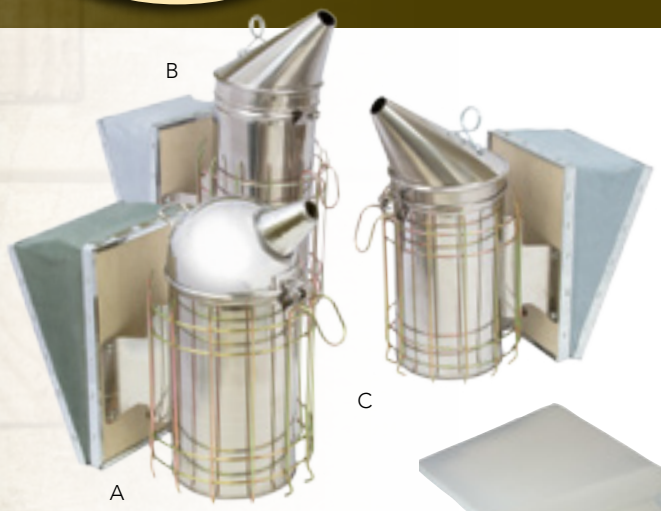

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It's Summers Time –

Winter, Planting and Birds

A week ago we woke up to a temperature of 1°. That's what it said on the weather app on my smart phone. I love this phone. I resisted for a long time, but now I'm hooked on my IPhone. I love that I can see how cold it is outside, before I ever get out of bed. And I can see that on that same morning it was -15° in Turtle Lake, WI – Kim's home town. So then I didn't feel so bad about our 1°. Of course it was 68° in Oceanside, CA where my brother lives.

We've been lucky so far when it comes to snowfall. We haven't had much at all. And we've had a good bit of sunshine which makes the cold a little easier to deal with.

One of my favorite Winter activities is watching the birds. Kim diligently fills the six or seven bird feeders that we have and then I and the two fat cats get to enjoy the view. We have a deck just off of our dining room and sometimes there will be up to 20 birds right outside the sliding glass doors. It's a great distraction when you're supposed to be working.

We have mostly sparrows, finches and starlings, but there are also one or two bluejays that come through and occasionally morning doves. But the most amazing one to me is one of God's greatest creations – the cardinal. We are lucky here in Ohio to have the cardinal as our state bird. Just this morning as I'm writing this I've seen at least three males and several females and youngsters. That splash of red that you can see from yards away is so stunning. I can see how people get interested in birdwatching.

Watching the feeders provides an ongoing cacophony of color and the constant jostling for perches and the flurry of wings. I love it when something unseen by us humans startles them and they're off, in a flash and a panic. Every one. Gone. Then, one comes back, then three and it starts all over again.

Kim and I did a frost planting on some small patches of land. You can kill the grass by covering it with cardboard or plastic – you don't have to use chemicals. If you don't kill the grass first then you have lots of competition for your Spring flowers. Then just scatter your seeds, preferably when there is no snow on the ground but the ground has frozen.

There are several places you can order wildflower seed mixes especially attractive to honey bees and other pollinators. Check out the ad index in this issue. It's a great way to get more food out there for our bees and eliminate some of the mowing.

We've done this at the Root Company property and it has been very successful. This will be our third Summer for several gardens there and they are flourishing.

Good nutrition is one of the top things we struggle with as beekeepers so try and help out where you can. Don't forget about seed bombs also which you can just throw out anywhere you see bare land – roadside ditches, your neighbors back field.

Speaking of nutrition, have you tried any of these online food companies that send you all of the ingredients and instructions on how to prepare a good healthy meal? We decided to try one about six months ago. So every other week three meals arrive with all of the ingredients, except butter, milk, oil – things you already have. You can schedule it for every week if you want, you can pause the deliveries if you're leaving town and you can cancel anytime you want. The one we've been using is called Hello Fresh. There are several that seem to offer basically the same kinds of food.

I can say that we have enjoyed most of the meals. Nothing has been inedible. We've been exposed to some different seasonings and have to watch the spicy stuff. You know "Food shouldn't hurt" as Kim loves to say. They tend towards healthy – a lot of Couscous and Quinoa – and I've learned some new cooking techniques along the way. It's been fun, so we'll keep it up for awhile.

Cost wise it comes to about $12/meal/person. Although we usually have leftovers that make a lunch or two. And it's delivered right to your door. That's a big plus.

We're getting ready for the Spring Beginning Beekeeper classes. Kim has been teaching for probably 20+ years and for most of those I've been his grunt labor. I look forward to it every year. It's always fun to see people start to understand beekeeping. Not everyone sticks with it, but we get a lot of new beekeepers that got their start with Kim. He's constantly having people come up to him at meetings or sending him emails saying I took your class 12, 15, 17 years ago and I'm still keeping bees. That makes the extra long days we spend worth it.

Spring is on the way! The years seem to go by faster and faster the older I get. Start planning that garden and getting ready for your bees now. It will be time before you know it.

Bee Culture
The Magazine Of American Beekeeping

First Lady Michelle, and President Barack Obama,

Now that you have officially completed your tenure at the White House, my letter cannot be construed as either political or partisan, but only for what it is…a very big Thank You.

As I recall, shortly after you moved into the White House Sam Cass, your Chef, suggested planting an organic garden on site to supply your family and your guests with what he considered the best food he could obtain. He wanted his meals to be free from all the things that fruits and vegetables raised in a traditional manner – manufactured fertilizers, pesticides and all the rest – offered. His taste in good food is legend and this was a part of it. So, plans were made to plant an organic vegetable garden for this purpose on the south lawn, close to the fountain and that large, old magnolia. There, it was clearly visible from the south fence for everybody to see. Fortunately someone, perhaps Sam or maybe even you realized that a vegetable garden without ample pollination would not be very productive, and the best way to supply pollination was to have a colony of honey bees nearby.

Then you learned there was a beekeeper on staff. Indeed, Charlie Brandts, one of the carpenters there was a beekeeper, and you asked what would it take to set up a hive near the garden. But Charlie wasn't the only person consulted. Your dog Bo had to be considered too, and the thought of him sticking his nose in the front door of a beehive didn't seem all that appealing to anybody, so that hive had to be high enough off the ground so that couldn't happen. Then there was the turbulence from Marine One that flies over on a routine basis that had to be allowed for, so a heavy duty strap was added to keep the hive from being tipped over. And there you have it, a bit unconventional, but nevertheless the first beehive on the White House lawn, ever.

I'm sure you are aware of how much attention that beehive got….certainly from beekeepers everywhere, but also from all of us concerned about healthy pollinators, good pollination and simply honey bees. Your good ideas pointed to a whole world of science, of gardening, of entomology, of honey, of candles, of flowers, of good food and, finally, toward the plight of the honey bee and the President's Directive to help honey bees, and all pollinators with the problems they are still having.

Our industry works hard to help pollinators every day, but your attention clearly shed a brighter light on our efforts. Thank you for that, and for teaching kids everywhere about gardens and good food, about the honey you shared with your visitors and friends, and for the good things that have happened, and will continue to happen because of what you started.

May Saint Ambrose Bless you and your family, Charlie Brandts and Sam Cass, too.

Sincerely,

Kim Flottum, Beekeeper, and
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A Closer LOOK

VARROA MITE POPULATION GROWTH

Clarence **Collison**

A factor that might contribute to the growth of Varroa populations is the migration of mites into colonies on foragers from other hives.

The population growth and virulence of the *Varroa* mite (*Varroa destructor*, Anderson and Trueman) depends on numerous factors. The most obvious ones are race and strain of bee (Fuchs and Bienefeld 1991; Moretto et al. 1991; Kulincevic et al. 1992), climate (De Jong et al. 1984; Ritter and De Jong 1984; Moretto et al. 1991) and possibly *Varroa* biotype (Delfinado-Baker and Houck 1989). In cold and temperate climates, the number of mites increases about 10-fold per year and infested colonies collapse after about four years (Fries et al. 1991; Korpela et al. 1992). In tropical climates the parasite seems to be less virulent (Ritter and De Jong 1984; Engels et al. 1986).

In April and October mite-free honey bee colonies were artificially infested with 50 *Varroa* mites each and treated with the pesticide Apistan® after a period of 24 weeks. Population growth was studied in 24 colonies from April to October and six colonies from October to April. The proportion of *Varroa* mites that invaded the test colonies after the initial inoculation was monitored in colonies that were constantly treated with Apistan®. Conservative calculations suggested that the initial mite population in a honey bee colony increases on average about 300-fold during one year in central California. This result excludes the contribution of additional mites that invaded the colonies (Kraus and Page 1995).

Varroa mite population growth was monitored in honey bee colonies from 1993 to 2002 in Baton Rouge, LA. Monitoring occurred in colonies with queens from miscellaneous U.S. sources that had not been selectively bred for varroa resistance (Harris et al. 2003). Mite populations were measured at the beginning and end of short field tests that started in the late Spring of each year. Multiple regression analyses showed that *Varroa* mite population growth rate was dependent on two of six variables measured: 1) percentage of reproducing female mites and 2) proportion of total mites in capped brood. The population growth rate was not dependent on 3) mortality of mites in brood cells, 4) growth of the bee population, 5) capped brood area at the end of the test and 6) duration of the test. (Regression analysis is a statistical process for estimating the relationships among variables). Analysis of commonality indicated that the percentage of reproducing female mites explained ≈ 26% of the total variation in r (the correlation coefficient) and the proportion of total mites in capped brood explained 6%. The joint expression of both variables accounted for another 4%. Thus residual error reflected most of the total variation in r, which suggested possible climatic or environmental effects on mite population growth. The lowest growth rates occurred in three consecutive years of drought in Louisiana. Measures of ambient temperature and relative humidity correlated to growth of mite populations among different years. Reduced growth rates were probably the result of diminished reproductive rates by *Varroa* mites during periods of hot and dry weather.

"Varroa mites can disperse and invade honey bee colonies by attaching to "drifting" and "robbing" honey bees that move into non-natal colonies."

The population dynamics of *Varroa* mites were studied in colonies during the Summer in the region of Thessaloniki, Greece. The reproductive rate of the mite was estimated by examining the progeny of 364 females in worker cells and 131 in drone cells containing pupae with dark eyes and light brown thorax (i.e. nine days after the worker cells and 10 days after the drone cells were sealed). The proportions of non-egg laying mites on the two kinds of brood were about 19% and 4%, respectively. The reproductive rate was 2.92 for mites in worker cells and 3.66 for mites in drone cells. The rate for females reaching adulthood from each original female mite, for a single passage through the brood cells, was 0.71 for worker and 1.70 for drone brood (Ifantidis 1984).

Mite infestation density may also effect population growth within colonies. Infestation levels by adult *Varroa* mites and offspring numbers were recorded in worker brood cells (day 14-20) and drone brood cells (day 17-23) under German climatic

"Russian bees were less attractive to Varroa mites."

conditions. The numbers of offspring likely to develop to adulthood were calculated according to a scheme based on the developmental stage of each pupa and the time interval to uncapping of the brood cells. With increasing numbers of *Varroa* infesting a cell, the numbers of female offspring per *Varroa* decreased within both cell types. Apparently, this decrease was based on fewer offspring produced per *Varroa* rather than by complete non-reproduction of some mites. Reproduction within combs, calculated according to the mite distributions, was even lower. This density-dependent reproduction is likely to influence population growth considerably. With increasing cell infestation, the proportion of males increased, thus reducing the bias of the sex ratio towards females (Fuchs and Langenbach 1989).

Since it has been shown that environmental factors can impact *Varroa* mite population growth, the reproductive behavior of female mites invading worker brood cells during the Winter months (January to mid-March) was investigated in four colonies in the UK. The number of viable offspring produced during a reproductive cycle, per mite, was only 0.5 during Winter compared with 1.0 during the Summer. This was mainly due to a large increase in the population of non-reproductive mites (Winter 20%, Summer 8%). This increase can be explained by the high level of male offspring mortality observed in Winter (42% vs. 18% in Summer), which results in nearly half of the newly reared female mites being unfertilized. Since mites that do reproduce lay a similar number of eggs in Winter ($\bar{X}$ = 4.7) as in Summer ($\bar{X}$ = 4.9), and the level of mortality suffered by the first female offspring is similar in Winter (7%) as in Summer (6%), it is probably not the internal physiological state of the host which causes the high level of Winter non-reproduction, as has been previously suspected (Martin 2001).

Varroa mites have relatively low reproductive rates, so populations should not increase rapidly, but often they do. One factor that might contribute to the growth of *Varroa* populations is the migration of mites into colonies on foragers from other hives. DeGrandi-Hoffman et al. (2016) measured the proportion of foragers carrying mites on their bodies while entering and leaving hives, and determined its relationship to the growth of *Varroa* populations in those hives at two apiary sites. They also compared the estimates of mite population growth with predictions from a *Varroa* population dynamics model that generates estimates of mite population growth based on mite reproduction. Samples of capped brood and adult bees indicated that the proportion of brood cells infested with mites and adult bees with phoretic mites was low through the Summer but increased sharply in the Fall especially at site one. The frequency of capturing foragers with mites on their bodies while entering or leaving hives also increased in the Fall. The growth of *Varroa* populations at both sites was not significantly related to the colony estimates of successful mite reproduction, but instead to the total number of foragers with mites (entering and leaving the colony). There were more foragers with mites at site one than site two, and mite populations at site one were larger especially in the Fall. The model accurately estimated phoretic mite populations and infested brood cells until November when predictions were much lower than those measured in colonies.

This transfer of mites to foragers is a shift in the mite behavior from attaching to nurse bees for reproduction (Kraus 1993; Kuenen and Calderone 1997) to foragers for possible dispersal. The frequency of this behavioral shift seems to increase in the Fall, and might occur for several reasons. *Varroa* populations are at their highest levels in the Fall and brood production is decreasing. There are fewer brood cells to infest so more mites are on worker bees perhaps including foragers (Sakofski et al. 1990). In hives that are highly infested with mites, the chemical profile of nurses and foragers can overlap causing mites to attach to foragers (Cervo et al. 2014). There are indications that foragers carrying *Varroa* have low returning rates to their own colonies (Kralj and Fuchs 2006) and could be drifting to other hives. The drifting could be due to parasitism alone or infection by viruses that *Varroa* transmit such as Deformed Wing Virus (DWV) or Israeli Acute Paralysis Virus (IAPV). Both viruses affect learning and memory (Li et al. 2013; Iqbal and Mueller 2007). DWV and IAPV titers increase with the growth of the mite population throughout the season reaching their highest levels in the Fall (Francis et al. 2013). Left untreated, these colonies collapse over the Winter. Viruses vectored by *Varroa* that affect forager orientation causing them to drift could provide a mechanism for both the virus and the mite to disperse in the Fall from colonies that are likely to die over the Winter.

Cervo et al. (2014) investigated the factors regulating the dispersal of *Varroa* mites. They showed that at low mite abundance, mites remain within the colony and promote their reproduction by riding nurses that they distinguish from foragers by different chemical cuticular signatures. When mite abundance increases, the chemical profile of nurses and foragers tends to overlap, promoting mite departure from exploited colonies by riding pollen foragers.

Varroa mites can disperse and invade honey bee colonies by attaching to "drifting" and "robbing" honey bees that move into non-natal colonies. Frey and Rosenkranz (2014)

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quantified the weekly invasion rates and the subsequent mite population growth from the end of July to November 2011 in 28 honey bee colonies kept in two apiaries that had high (HBD) and low (LBD) densities of neighboring colonies. At each apiary, half (seven) of the colonies were continuously treated with acaricides to kill all *Varroa* mites and thereby determine the invasion rates. The other group of colonies was only treated before the beginning of the experiment and then left untreated to record *Varroa* population growth until a final treatment in November. The mite invasion rates varied among individual colonies but revealed highly significant differences between the study sites. The average invasion rate per colony over the entire 3.5 month period ranged from 266 to 1,171 mites at the HBD site compared with only 72 to 248 mites at the LBD apiary. In the untreated colonies, the *Varroa* population reached an average final infestation in November of 2,082 mites per colony (HBD) and 340 mites per colony (LBD). All colonies survived the winter, however, the higher infested colonies lost about three times more bees compared with the lower infested colonies. Therefore, mite invasion and late-year population growth must be considered more carefully for future treatment plans in temperate regions.

The growth rate (r) of Varroa mite populations in Russian and Italian honey bee colonies was monitored from 2001 to 2003 in Baton Rouge, LA. Over this period, De Guzman et al. (2007) consistently showed lower mite growth in the Russian than in the Italian colonies. In 2001, instantaneous growth rates per week (r_7) were r_7=0.191± 0.011 for mites in Italian colonies and r_7 = 0.137± 0.012 in Russian honey bees for 24.3 weeks. These growth rates were equivalent to 159.1- and 61.6-fold increase, respectively. Divergence in r_7 values also was observed in 2002 when Russian colonies supported a lower growth rate of r_7 =0.061± 0.016 (9.3-fold increase) than the Italian colonies (r_7 = 0.122± 0.01 or a 31.7-fold increase) did after 26 weeks. The lowest rate of r_7 =0.021± 0.011 (a 1.4-fold increase) was recorded for Russian honey bees in 2003, whereas the Italian bees in that year supported r_7 = 0.145± 0.009 (an 18.9-fold increase after 19 weeks). This low growth rate of mite populations in Russian colonies may be attributed to several factors. Notably, as this study showed, Russian bees were less attractive to Varroa mites. Furthermore, the Russian stock supported lower proportions of brood infested and fewer multiply infested cells in both worker and drone brood, reduced mite reproduction, and extended phoretic period.

Arechavaleta-Velasco and Guzman-Novoa (2001) conducted a study to determine the existence of phenotypic and genotypic variation in the ability of honey bee colonies to restrain the population growth of the Varroa mite and to access the relative effect of four characteristics that many confer tolerance to honey bees toward the mite. Fifty-eight colonies infested with an equal number of mites were sampled monthly during six months to determine their levels of infestation on adult bees and in worker brood. At the end of this period, 16 colonies were selected to study the effect of grooming behavior, hygienic behavior, brood attractiveness and host-induced non-reproduction. The infestation-levels in adult bees varied significantly between colonies (range 6.6-44.7%), but no differences were found in the brood infestation levels. The variation between colonies was partially genetic in origin. Grooming behavior explained most of the variation (r^2 =0.38). Negative correlations were found between the mite population growth and both the total number of mites and the

number of injured mites collected from the bottom-boards (r=-0.65 and r=-0.76, respectively. Differences were found for hygienic behavior but the effect of this mechanism was not clear. No differences were found among colonies for brood attractiveness, or for the effect of the brood on the mite's reproduction. BC

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Notes From The Hawaii Meeting

WAS 2016

Malcolm **Sanford**

One more look back at an iconic Hawaiian scene as WAS moves from Honolulu 2016 to Davis, CA for the 40th Annual Conference in 2017. This and more photos on pages 18 and 19 by long time WAS member and regular conference attendee Kevin French, of North Dighton, MA.

The 2016 version of the Western Apicultural Society (WAS) met in Hawaii October 12 through 15 in the Ala Moana Hotel on Waikiki Beach, atop the extinct volcano, now known as the island of Oahu. At least 2500 miles from any mainland, the location was as intriguing as was the event itself, a truly international gathering of scientists and beekeepers from around the Pacific rim. The theme, "new insights into old questions," provided a backdrop bringing speakers from across the globe to the **Hawaiian archipelago**, which stretches northwest across the Pacific all the way to Midway Atoll. A brand new island is ready to break surface to the southeast of the Big Island (Hawaii) becoming the latest addition to these fabled lands, somewhere into the next tens of thousands of years. It is possible, however, that **Loihi** will not breach the surface as it traverses one of the world's best known "hot spots" and will remain a seamount for its entire existence. Time will tell.

Some History

It is difficult not to wax on about these islands, which collectively are the U.S.'s 50th state, the only one in Oceania, and steeped in aboriginal culture. The history of beekeeping of the State is just as fascinating in its details as provided by Scott Nikaido of the University of Hawaii at Manoa, reporting on information published by Kevin M. Roddy and Lorna Arita-Tsutsumi at the University of Hawai'i at Hilo:

"At the first meeting of the Royal Hawaiian Agricultural Society in August 1851 on the island of O'ahu, a committee was appointed to bring the first honey bees into Hawai'i. Henry A. Pierce, partner of Charles Brewer, shipped a 'fine hive' from Boston to Honolulu in 1852 on the good ship R.B. Forbes (Krauss 1978). Unfortunately, as the ship passed through the tropics on its way to Cape Horn, the increase in temperature melted the honeycomb and killed the honey bees. Another colony was ordered from New Zealand at about the same time, but was never shipped due to an apparent misunderstanding (McClellan 1940). A second attempt to ship bees from the U.S. Mainland was made in 1853, again from Boston. Two hives, one packed in ice, were shipped to O'ahu. The hives arrived in poor condition, and were later auctioned to C.R. Bishop, husband of Bernice Pauahi Bishop, for thirteen dollars (Krauss 1978). The bees survived for a short time, then died out. The society then made a public offer of ten dollars to "the person who shall introduce the first honey bee into the islands.

"On 21 October 1857, three hives of German dark bees *Apis mellifera mellifera* were shipped to Honolulu by William Buck of San Jose, California (Eckert 1951, Krauss 1978) on the American bark Fanny Major (Spoehr 1992). The trip took 18 days and the colonies survived the journey in good condition. They were purchased by the Society for one hundred dollars each. The hives were placed under the care of Dr. William Hillebrand in Nu'uanu Valley. There they thrived, and successfully established themselves such that by the following year, the three original hives had increased to nine colonies by swarming (Nieman 1942). Other species of honey bees were soon brought to the Islands. Italian bees *Apis mellifera liguistica* were purchased in Los Angeles, shipped to San Francisco, and then brought to the Islands on the steamer Lehua in 1880 by Sam G. Wilder (Chamber of Commerce, 1941)."

Since introduction, honey bees, like many of the introduced species on the islands, led a carefree life, as did beekeepers. The industry grew rapidly, in the 1970s becoming a mecca for queen production. However, the risks of introduced organisms were always there, thus: "The Territory instituted a ban on the importing of packaged bees beginning on 17 September 1908. As of 1 December 1909, no serious bee diseases of any kind had been reported. The presence of bacillary diseases (*Bacillus larvae*) in California and elsewhere 'makes the quarantining of bees and honey entering the Islands a

necessary measure for the protection of the industry' (Fullaway 1909). The ban remains in effect today."

Unfortunately, it couldn't last. *Varroa* was detected in 2008 and the small hive beetle (SHB) in 2009. As on the mainland, these organisms caused great problems with a 65 percent loss on Oahu and thousands of colonies lost on the Big Island, named Hawaii. Some four islands remain *Varroa* free, while SHB is found on all. The minutes of the Hawaii Beekeepers Association for February 25, 2008, 6:00 P.M. reveal the urgent issues of the time: "Items of interest for open discussion included: *Varroa* containment: area-wide campaign?; extermination of ALL bees on O`ahu: the SuperFerry's role in spreading *Varroa*; *Varroa's* impact on managed and feral colonies, diversified Ag, food security and self-sufficiency; The problem of "Rogue Beekeepers" and *Varroa* control; "death" of Apiary Act of 2008 (SB2586); Status of SB2586: COOL and definition of honey as a commodity under HRS Chapter 147; threats to valuable organic, pure honey's reputation; residues of *Varroa* miticides and seed corn pesticides in honey; Farmers Markets a continued success for the HBA and members with branded honey products."

So far, the 1908 law has not been repealed. The 2008 attempt to develop a new one (SB2586) looks dead. Several comments were published concerning this effort at the time, which appeared to concentrate on eradicating honey bees from the island of Oahu. The following comment about this legislation was **published** by Gus Rouse, then owner of Kona Queen, who has subsequently retired:

"As the largest beekeeper in the state of Hawaii I don't think SB2586 is what we need at this time. The beekeepers who do not want the DOA to know where their hives are located now are not going to register them if we have a law. The *Varroa* mite will eventually kill most of these hives anyway.

"I strongly feel the state needs to put it's resources into moving forward with THE PLAN already in place. This is the Plan to attack the wild bee population and then follow up with exterminating the domestic hives in a coordinated effort. I already have the hives ready to replace the ones lost for those who need pollination.

"There remains a $5-7 million dollar rural industry in Kona that leads the world in queen and organic honey production. Introduction of the *Varroa* mite to this island would be devastating to both. This does not include the pollination benefits to coffee, mac nuts, and many other agricultural crops.

"The *Varroa* mite has made it's way to nearly every corner of the globe. Hawaii has an opportunity to take action or ignore the issue. We hear Hawaii wants to support and protect agriculture and this would be a good time to demonstrate just that."

Moving On . . .

The **state beekeepers association** published its last newsletter in 2005 and by some accounts is in disarray. The **Big Island Association** appears somewhat more up to date in its activities. In April 2011, participating in that year's WAS conference, Larry Connor of **Wicwas Press** wrote an article for American Bee Journal relating his visit to Big Island Queens, one of three major producers on Hawaii. There was no mention in his article concerning the legislation.

According to Mr. Nakaido, as of 2011 there has been a resurgence in interest in beekeeping via bee clubs and social media, but no registration regulations could mean lots of potential problems. There is no package queen industry in Hawaii; all islands have queen producers. At that time, however, a state apiary program was established.

The current beekeeping regulation situation was reported by Lauren Rusert Hawaii **Apiary Program Section Chief**: "Our program was officially established in 2011. We are here to provide services to the bees and the beekeeping industries in Hawai`i. Honey bees are not native to Hawai`i, but they have been here for over 150 years, providing a variety of excellent honey and, most importantly, pollination for many plants. Local agriculture depends heavily on honey bee pollination. Beekeeping industries in Hawai`i include honey production and queen bee rearing for export." Thus, this program appears to be mostly a service organization to beekeepers, farmers and the general public, rather than a regulatory effort. Beekeeper registration in the State is voluntary only. All this could change in the future, however, as more and more attention is paid to the health of the honey bee and the state's beekeepers.

Demographics and Research

Ms. Rusert provided updated statics on the beekeeping industry: The number of beekeepers by island is 130 (Hawaii), 37 (Kauai), 44 (Maui), 38 (Oahu), seven (Molokai) and four (Lanai). Before mites, the average honey production was 93 pounds/hive and the State was 2nd in the nation in honey production with a value of $3.5 million. Bee pollination was valued at $212.8 million. Because the climate allows for year around bee production, there are three large and several smaller outfits producing 75 percent of Canadian queens and 25 percent of the U.S. mainland supply, valued at $10 million, equal to papaya and banana production in the State.

Varroa control is a mix of the usual compounds including Apivar®, Mite Away Quick Strips MAQs®, Apistan®, Hopguard®, formic and oxalic acids. Screened bottom boards, drone trapping are also on the menu. Unfortunately, the tropical weather conditions mean chemical materials are difficult to use and may quickly lose efficacy. Beetle control measures include Brawny-Dine-A-Max® towels, diatomaceous earth and various mechanical traps. Mating nuclei are at high risk; full sun and strong colonies are considered the best prevention.

Ms. Rusert provided an interesting discussion on the American foulbrood epidemic on the Molokai Ranch in 1938. The disease wiped out 2400 colonies at the time. All but 246 were burned. The following is the conclusion of the Molokai incident from the history referenced above: "From 1938-1948, commercial honey production on Moloka'i virtually ceased. In 1948, the Ranch tried to revitalize the industry and hired apiarist Allen Luce. When Mr. Luce assumed control, only 86 colonies existed, of which 13 were infected with Foulbrood (Eckert 1951). As of 1953, this disease was successfully eradicated, as no feral swarms were found to have it. Encouraged by their victory, University of California, Davis researchers continued to study the disease, and purposely infected several colonies at the Moloka'i Ranch with the disease to study resistance-building. As a result, bees demonstrated

a greater resistance to Foulbrood, which was due to several factors. Subsequently, steps were taken to reproduce these strains and cross breed in an attempt to increase overall resistance in all races (Eckert 1950, 1951)."

The genetics of Hawiian bees include the usual suspects: German, Italian, Carniolan. Many hybrids are likely, but so far no Africanized honey bees have been found. Several mitochondrial DNA mitotypes have been found, including African and Ethopian, some five lineages total.

Lessons learned concerning *Varroa* resistance on the mainland and elsewhere have resulted in *Varroa* Sensitive Hygiene (**VSH**), mentioned in Dr. Connor's article referenced above, being introduced since 2009. Several field trials are ongoing with about 228 colonies in a test yard. Mite samples are taken at six-week intervals and open mating is being employed. The VSH breeding is expected to continue with a single-drone insemination (SDI) component in the future. The team of researchers includes local producers, **Arista Bee Foundation**, ex-apiary inspector Danielle Downey (now employed by Project Apis m (**PAM**), Hawaii Department of Agriculture and the Baton Rouge bee laboratory.

Dr. Helen Spafford at the University of Hawaii is from Australia and well versed in biosecurity issues. She reported that the State may get 20 species of new insects each year due to human movement coupled with high amounts of environmental disturbance. Other possible introduced organisms include viruses, fungi, microbes and of course, plants. New in the environment are the **coconut rhinoceros beetle** and **coffee berry borer**. So-called "rapid ohia death" is also on the **list**. This is a "perfect storm" for the State that continues Dr. Spafford concluded, mostly because biosecurity in general is low, especially when compared to places like Chile and the Galapagos Islands. One beekeeper characterized the beekeeping environment as the "wild west." Dr. Spafford says that biosecurity is simply not a priority for law makers and politicians at the moment, and there is limited federal assistance. Fortunately, there is more recognition of the issue and so beekeepers, farmers and others may begin to see what can only be called a "sea change" in this area in the future.

The Honey Bee Project

The University of Hawaii is increasingly a player in honey bee research on the island through The Honeybee Project: "We are interested in developing practical treatment options for local beekeepers and establishing a sound research program that focuses on maintenance and improvement of the Hawaiian honey bees. Reducing the likelihood that the mite will invade other islands, and restricting the big island invasion is also a high priority, and we are investigating procedures for preventing feral bees from being inadvertently transported among islands on ship containers and other vessels. The goal of this website is to keep beekeepers and farmers informed of the bee-*Varroa* issues in the islands and to facilitate the transfer of information from the University to the public."

Several folks associated with this project addressed the WAS conference. One emphasis was viruses. Both Dr. Stephen Martin and Ph.D. candidate Laura Brettell of the **University of Salford** in the United Kingdom provided their observations on the viral situation in the islands and elsewhere. Dr. Martin related an interesting history of the thinking about viruses. It could be that many of the issues affecting honey bees and reported on in the past, such as Isle of Wight and/or so-called **disappearing disease** might have been viral in nature, but these were not even in the discussion at that time. Viruses are also not mentioned as a major source in a more recent disease called Colony Collapse Disorder (**CCD**), but that is likely to change as this so-called "missing link" is slowly becoming more recognized. As late as 1996, according to Dr. Martin only 18 viruses were known. There are many more with numerous variants, some benign. His initial predictions about viruses affecting honey bees were basically ignored by the scientific establishment for quite a period. However, observations that some honey bee populations with high *Varroa* counts did not necessarily collapse, unless the viruses were present, and technology to identify these organisms has finally given Dr. Martin's ideas some credence that they are indeed hugely important in honey bee health. He and Ms. Brettell continue to look at them via something called quantitative polymerase chain reaction (**q-PCR**) as noted in a summary of a **recent paper**:

"Martin et al. (p. 1304) exploited this unique situation to study the mechanisms behind the emergence. Honey bee populations have long been established on the isolated Hawaiian Islands but only recently have some islands become infested with the *Varroa* mite. This mite has selected for a single viral pathogen-deformed wing virus among the honey bee population, with the appearance of a single dominant virus strain, which has now spread worldwide. Thus, a normally benign viral pathogen has become one of the most widely distributed and contagious insect viruses on the planet."

The paper's abstract says:

"Emerging diseases are among the greatest threats to honey bees. Unfortunately, where and when an emerging disease will appear are almost impossible to predict. The arrival of the parasitic *Varroa* mite into the Hawaiian honey bee population allowed us to investigate changes in the prevalence, load, and strain diversity of honey bee viruses. The mite increased the prevalence of a single viral species, deformed wing virus (**DWV**), from ~10 to 100% within honey bee populations, which was accompanied by a millionfold increase in viral titer and a massive reduction in DWV diversity, leading to the predominance of a single DWV strain. Therefore, the global spread of *Varroa* has selected DWV variants that have emerged to allow it to become one of the most widely distributed and contagious insect viruses on the planet."

More On Virus and Types Of Mites

Ms. Brettell discussed at some length her study of the honey bees of **Fernando de Noronha island** off the coast of Brazil. It has long been known that this population of European honey bees has tolerated *Varroa* mites without much damage. Her conclusion is that both low honey bee population and mite reproductive levels have yet to allow viruses to take hold. She called the situation on the island "a ticking time bomb." This is similar to present conditions on both Maui and Oahu. This information could turn traditional ideas about *Varroa* control on their head. Those looking at mite control might

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be able turn their attention to Viral effects instead. If this is so, perhaps an inoculation, something akin to a flu shot in humans, might have a similar effect for honey bees. A question from Treavor Weatherhead of Australia concerning the mite haplotype on the island was not answered adequately. It is known that the first mites coming to South America were of the Japanese variation; the Korean haplotype is much more destructive and was introduced later. It is not clear whether a mite haplotype analysis was conducted by Ms. Brettell. So far there are **18 total** with two above being most predominant in the five-species *Varroa* mite **complex**. She will be looking further into the situation.

Jessika Santamaria, University of Hawaii, Manoa is studying something called "viral spillover." Many of the variant viruses associated with spread of deformed wing virus (**DWV**) in honey bees have now been found in bumblebees. There is also evidence that these and perhaps other viruses could be spread via pollen to other insects in the islands and elsewhere. Investigations in this area continue.

Other Research

Dr. E.M. Villalobos, currently in charge of both research and outreach efforts of the University of Hawaii Honeybee Project, is looking closely at wintering bees in Hawaii. This is complex issue, given the geography of the island, which has a variety of microclimates, mixed timing of both dry and wet seasons and basically no temperate winter. There simply are no patterns beekeepers can look at to guide them in making management decisions, making it difficult to develop any standardized apicultural calendar. It is more problematic given that both honey and queen production can demand different conditions and situations. Dr. Villalobos soldiers on and has training in this given her experiences in Costa Rica. In addition, she is looking at honey bee diets on the archipelago.

Dr. James Wilkes of Appalachian State University discussed his ideas behind development of a computer application called **Hive Tracks**. The idea is that computer technology can assist beekeepers in making sense of the vast amount of potential information they get when visiting hives. It seeks to find a "big data" gap that exists and is based on something called and an "Intelligent Management System." Hooking up a number of beekeepers is the best way to innovate collectively concluded Mr. Wilkes, who is partnering with **Project Apis m**, the Bee Informed Partnership (**BIP**) and other organizations. Look for a commercial beekeeper edition of Hive Tracks to come out soon.

Dr. Patricia Couvillon University of Hawaii, comparative psychologist and neurobiologist, gave a discussion of her findings using the honey bee. She concluded that "the honey bee is not a little robot." The insect has some cognitive abilities equivalent if not superior to the sea slug, octopus and several crustaceans. It is the best equipped invertebrate for brain study. Research in the proboscis extension reflex (**PER**) and studies by Von Frisch on dances show that these insects are similar to vertebrates, such as **conditioned reflexes** shown in Pavlov's dogs and other mammals. Pushing the envelope Dr. Couvillon claims that honey bees show abstract learning, something often confined only to humans. Several of her papers are found at **Research Gate**.

Other Countries

WAS featured a rather large contingent of Latin Americans. Professor Enrique Luciano Bedascarrasbure described a network designed to foster research, extension and innovation. He is a researcher at the National Institute of Technology in Argentina (INTA) and Apiculture Professor at the Universidad Nacional del Centro. The network called Redlac is a new platform aiming to foster apiculture as a development tool in Latin America and the Caribbean (**FONTAGRO -IICA- BID**) and the project FONTAGRO-AVINA which aims to foster development in the Gran Chaco region. The **REDLAC** effort had a stand in the exhibits area showing some of its attributes.

Dr. Natalia Bulacio Cagnolo, with degrees in biodiversity and biological sciences is a researcher in the Argentine National Apicultural Program (ProApi) cooperating with several groups, including the National Bee Heath Commission (**CONASA**), the European COLOSS initiative, and REDLAC. She administers the

Argentine government's program regulating production and sale of Varroacides. Argentina is quite diverse in beekeeping efforts, having northern tropical and more southern temperate conditions. The former consists of small-scale rural beekeepers while the latter is much more industrialized. Like Hawaii, these differences call for beekeeper and regulatory flexibility.

Dr. Ana Cubero from Costa Rica is also affiliated with REDLAC. She is in charge of the national beekeeping program and professor at The Technical University of Costa Rica. Her discussion of chemical control methods for *Varroa* and conservation of the "organic" status of the nation's honey was well received.

Licenciado Marianyela Ramirez Montero, also of Costa Rica, looked at both formic acid and thymol *Varroa* treatments of Africanized honey bees in that country. Her conclusions were that thymol does not penetrate the brood cappings and formic acid does, making it a superior mite killer.

In Hawaii, formic acid appears to be used with considerable success among large-scale queen breeders, confirming this as the treatment of choice at the moment. It is not known, however, if **resistance to this treatment** will build up over time, but the chances seem much less than for other chemicals currently in use.

NSA-Apis Bees

Another parallel with Latin America is Hawaii's growing awareness of the importance of native non-Apis bees. Among researchers in this arena are Dr. Jonathan Koch looking at pollinators on the summit of the active volcano **Mauna Loa** (Hawaii); Dr. Karl Magnacca, Oahu Army Natural Resource Program, who has described 13 species of native bees; Dr. William Haines Hawaii Department of Land and Natural Resources, developing rearing facilities for native insects; and Dr. Jason Graham, attempting to rear and release endangered, endemic yellow-faced bees, the first insects of this nature to make the federal endangered species list. Many of these efforts are confounded by pressure from other introduced insects, especially ants.

Dr. Ingrid Aguilar from **CINAT**, National University of Costa Rica described efforts to support meliponiculture in the country. She frequently travels providing support to those interested in this activity.

Alejandro Reyes Gonzalez of the Autonomous University of Mexico is researching the rich fauna of family **meliponidae** in Northwest Mexico. He is both a beekeeper and a commercial pollinator of avocados. A big challenge in the culture of stingless bees is to ensure their survival as the major way they are cultivated is by collecting nests in the wild. Meliponiculture is not even on the radar for Hawaii presently. None of these insects have been found there.

The WAS conference was topped off by presentations of Professor Emeritus Dr. Eric Mussen, University of California, Davis on pesticides and honey bees and an enthusiastic discussion by Beth Conrey, President of the Colorado Beekeepers Association, who did a **Ted talk** some time ago concerning honey bees. She provided a remarkable discussion of her current and future efforts to promote honey. The title of her talk says it all: "There is Money in Honey." Look for WAS to convene again next year in Davis, California. BC

Malcolm Sanford is the retired Apiary Extension Specialist for the state of Florida and frequent contributor and publisher of Apis Information Resource News.

Honey By The Ton From Top Bar Hives

Wyatt **Mangum**

This article provides data on cotton honey production from top-bar hives collected over two seasons. The first season was a trial run, setting the stage for a larger study in the second year. I am planning a third season too.

At the end of the growing season, vast expanses of cotton reveal the split open bolls (see Figure 1, see below), each boll once a white okra-like flower (see Figure 2) yielding nectar. (The plant also has extrafloral nectaries.) Cotton honey has a pretty light-amber color (see Figure 3). However, the honey is not regarded as "table grade," due to its bland taste and propensity to granulate. I have a long history with cotton honey as a strategic asset to feed my pollination top-bar colonies, knowing the difficulties without Summer nectar.

When I lived in Raleigh, North Carolina, I moved 200 two-foot long top-bar hives to the Rocky Mount area for cucumber pollination. That was about eight tons of top-bar hives, and I moved them working alone. I loaded the hives by hand on a small-sized truck and trailer, in the late 1980s. My colonies lost seven to 10 pounds while on cucumber contracts, before the remaining Summer would cost them even more honey. At first pest problems caused a ban on cotton production. Then cotton returned and my second largest bill–sugar–vanished. (Gasoline was the first.) So I learned the biology of cotton.

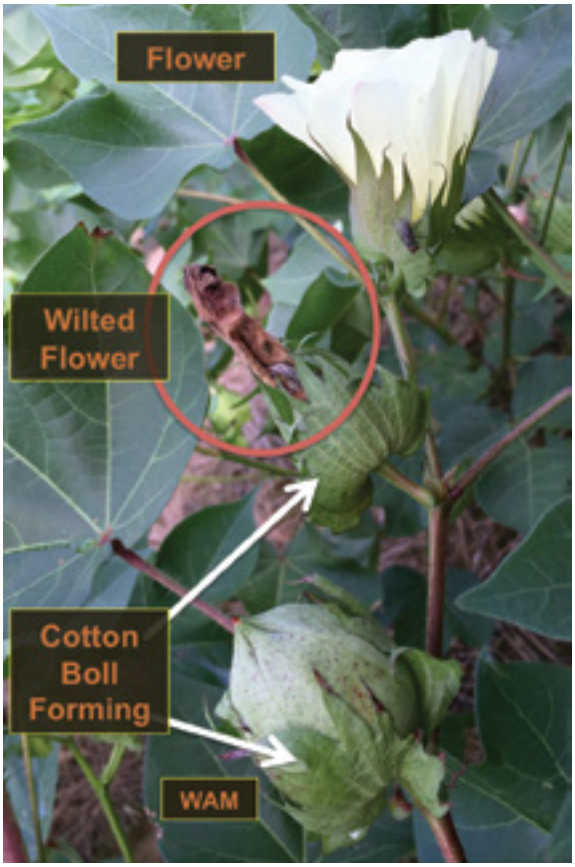

Figure 2. *A cotton flower. After the bloom (top) the flower wilts (middle), and the cotton boll forms (bottom), which eventually splits, exposing the snow-white lint.*

Now I live two hours North of cotton's Northern (reliable) range ending in Southern Virginia where cotton fields bloom from July well into late Summer. With occasional rains, cotton provides a slow steady nectar flow, a strategic situation to collect honey production data. I still need to watch my hives for summer swarms and usurpation, which are becoming more common. That is part of the new beekeeping reality as our bees are apparently undergoing genetic changes. (This past Summer 2016, I saw four summer swarms in the data-collection apiary. I did not see any usurpations. However, usurpations are not easy to witness.) So far pesticides have not been a problem with cotton, although I consider them a constant potential hazard.

On July 20, 2015, I moved five three-foot hives to

Figure 3. *Cotton honey in new comb. Instead of a long Summer dearth, my bees make cotton honey with a colony economy prosperous enough to build comb.*

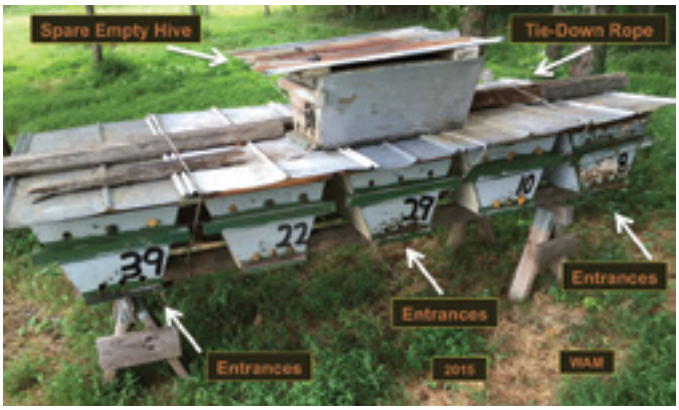

Figure 4. *For 2015, five three-foot top-bar hives. I want a flat shaded location with reliable truck access, and sheltered from strong thunderstorms. I cut a set of six entrances in both ends of the hive, but I only use one set at a time. I alternate the hive entrances. Scrap sponges block off the unused entrances as seen with Hive 22 and Hive 10.*

cotton. I put the hives on saw-horses and two-by-fours that were about even with the tailgate of the truck. The elevated hive stands reduced stress on my back. Most of the hive moving was shifting the hives horizontally between the truck and the hive stands. Figure 4 shows the hives for the Summer of 2015, on cotton for two months.

As shown in Figure 4, I alternated the entrance ends of the hives to reduce drifting. In addition, I kept the row of hives no longer than about five. Drifting, where bees enter the wrong hive, can create artificial foraging differences between colonies based on a hive's location. I cannot have that effect in my hive-weight data where each colony must forage independently of the others.

In collecting honey production data, the initial colony conditions and weather conditions are extremely important. In the Spring of 2015, I caught 17 swarms in my bait hives (30% of my bait hives caught swarms). First-season swarms usually do not produce surplus honey, but I felt these colonies could. They just needed an opportunity. Some colonies had a couple of extra empty combs, which I gave them in the Spring, if I had spare empty combs. Other colonies had no extra combs. Top bars with foundation strips (1½ inches wide served as comb guides) filled in the rest of the hives, except where I used small pieces of plywood, which did not provide any comb guidance. (I used the plywood because I ran out of top bars with foundation strips and thought their colonies would not completely fill the hives.)

My main concern with colonies so far from the house was – could they cover their combs and protect themselves from small hive beetles? In the heat of the Summer, small hive beetles can force a weakened colony from its hive–*evict the bees* while sliming its combs. Since the colonies matched the amount of comb in their hives from the Spring, I accepted that as part of the colony-to-colony variation in honey production (rather than trying to equalize them).

Over the Summer of 2015, the local cotton did not experience any serious drought, as far as I knew. Cotton can withstand some dry weather and still produce nectar. When the leaves droop I worry, but I never observed that.

In September, after two months on cotton, I moved the five top-bar hives back to their home apiary, beginning at dusk. I can load top-bar hives fairly quickly, but weighing heavy hives at the same time would slow me down while trying to finish before dark. I just loaded the hives and tied everything down because all that work had to be done correctly for safety on the highway. I weighed the hives in late afternoon the next day, letting the bees have ⇨

Table 1: Top-Bar Hive Honey Weights from Three-foot Hives on Virginia Cotton for 2015 (lbs)

Hive Number	Initial Weight July 20	Final Weight Sept 20	Final – Initial = Gain
39	46	139	93**
22	82	143	61
29	65	120	55
10	81	149*	68
8	82	141	59
Weight in Pounds	Sum = 356 lbs Total Weight	Sum = 692 lbs Total Weight	Sum = +336 lbs Mostly Honey
For 2015	Ave = 71.2 lbs	Ave = 138.4 lbs	Ave = 67.2 lbs**
Data Collected by WA Mangum, PhD 200 top bar hives	SE = 7.08	SE = 4.90	SE = 6.78
	SD = 15.83	SD = 10.95	SD = 15.17

*Three-foot long top-bar max hive weight = 150 lbs, about 50 lbs /ft

**Without the 93 lbs gain, the ave = 60.75 lbs

Figure 5. *Weighing a top-bar hive in 2015. I had to pick up Hive 22, and I balanced it on the platform scale. I needed to quit that lifting, and work smarter. Hive 22 weighed 143 pounds and gained 61 pounds, a typical result for the conditions explained in the text. That weight gain would be mostly honey, which is heavy at 12 pounds per gallon. (For comparison, water is eight pounds per gallon.)*

their first orientation flights undisturbed (see Figure 5).

Table 1 shows the hive weight data for 2015 along with some important statistics at the bottom. I know people mostly do not like looking at a table of numbers. Think of Table 1 as telling several stories with the plots hidden in the numbers. I will explain them. (These data tables with the weights in kilograms are on my website. Go to my main page at **TBHSbyWAM.com** and click the link at the top of that page titled "Top Bar Hives and Honey Production.")

To begin, an important number to remember is 150 pounds, my "theoretical" maximum weight of a three-foot hive crammed full of honey, or an extremely "honey bound" hive (at about 50 pounds per foot with my standard cross section size as shown in my book). I have had colonies break through this maximum weight, but rarely.

The first column in Table 1 shows the hive numbers. Starting out in July, the second column gives the initial hive weights. Three of the hive weights were surprisingly similar, in the eighties (82, 81, and 82 again). Nevertheless, one weight was lower at 65 pounds. In the Fall, an 80-pound three-foot long hive is usually heavy

Table 2: Top-Bar Hive Honey Weights from Three-foot Hives on Virginia Cotton for 2016 (lbs)

Hive Number	Initial Weight	Final Weight	Final - Initial
5	61	146	85
36	85	121	36
33	75	152	77
21	60	139	79
27	60	139	79
37	61	137	76
2	64	118	54
1	78	114	36
9	73	130	57
18	80	120	40
17	66	129	63
4	46	99	53
6	49	133	84
38	68	123	55
For 2016	Sum = 926 lbs	Sum = 1800 lb	Sum = 874 lbs
Data Collected by WA Mangum, PhD 200 top bar hives	Ave = 66.1 lbs	Ave = 128.6 lbs	Ave = 62.4 lbs
	SE=3, SD=11.3	SE=3.7, SD=14	SE=4.7, SD=17.7

enough to survive the Winter in my location of Piedmont Virginia. With no cotton over the Summer, the latter colony would need Fall feeding, and maybe the first three colonies, depending on how well they maintained their weight over the Summer.

Hive 39 would become the remarkable case, which started completely unplanned. When loading hives that morning, I wanted them coming from one apiary with similar weights, but I was one hive short. There was no time to drive to another apiary, and look for another hive, losing time to a rising sun, before a two-hour drive south. So on went Hive 39, last and the least in weight. At only 46 pounds, Hive 39 is roughly half the weight of the ones in the eighties. Hive 39 was like a late July swarm, not worth a fly as the old swarm rhyme goes. The colony appeared weak in the three-foot hive. It only occupied about the first one-foot of the hive (from the entrance

Figure 6. *Hive 8 full of bees for the Fall. Usually bees leave an empty comb or two next to the entrances, but not here. This colony needed to be in a five-foot hive. In the Spring such a strong colony would need careful management to prevent swarming. The wire mesh bracket held part of a pollen patty, which the bees quickly consumed.*

Figure 7. *Hives for Summer 2016. The horseshoe layout with alternating entrances is to reduce drifting and is efficient for hive mobility, loading, and unloading.*

end). In a race to the heaviest hive, Hive 39 started out way behind, but it could cover its combs.

Summing down column two, the hives initially weighed 356 pounds total or averaged 71.2 pounds per hive. However, that average included Hive 39, whose extra lower weight drove down the average somewhat. With averages, what exactly is included in the average is of monumental importance. Large or small numbers can have sizable changes on the average. Without Hive 39, the average increases to 77.5 pounds.

After foraging on cotton, the final hive weights are in the third column. Notice something very interesting. After being in a long nectar flow, the final hive weights became more uniform (less variation). Three weights are in the 140s pounds range, from the hives initially in the 80s. Hive 10, with a final weight of 149 pounds, missed the 150-pound maximum by one pound. Most striking, Hive 39 is only one pound short of getting into the 140s with a final weight of 139 pounds. Overall the final average weight was 138.4 pounds. (In Table 1, SE stands for Standard Error, and SD stands for Standard Deviation. These are statistics that give different ways of measuring variations in the hive weights. They need to be included with the data table.)

Figure 8. *Five-foot long hive, loading and weighing. Loading is easy – not weighing. Even the light-weight 165-pounder is hard to weigh. I used the long two-by-four to lever up the hive on the short two-by-fours. Then I let the hive down on the scale. I am working on improvements. I marked the location of the queen excluder. It divides the brood nest with nonsurplus honey (entrance end) from the surplus honey end of the hive (back end). With full-size colonies and honey crops, these hives could easily exceed 200 pounds.*

The fourth column of Table 1 gives the weight gains, as final weight minus initial weight. Here is where Hive 39 becomes prominent with a weight gain of 93 pounds while the other gains were mostly in the 60s, which were still quite good for first season swarms. At first I thought Hive 39 was an unusual case in a hive that started out two-thirds empty. (However Hive 39 did fit a trend that became apparent in the second year.)

Total weight gain was 336 pounds for five hives. In Table 1, on the row giving the averages, the average weight gain of 67 pounds included Hive 39, regarding its initial hive weight as not rare. If a colony like Hive 39 is uncommon, it will probably not be present in another arbitrary choice of five hives for cotton honey production. Then the average weight gain without Hive 39 may be the more appropriate one to use. That conservative average was 60.75 pounds (given below Table 1). The colonies returned healthy (see Figure 6). All of the cotton colonies survived the Winter and helped to keep last Winter's losses to 11%.

In the Spring of 2016, a long cold rainy period occurred in our main nectar flow. With the Spring nectar flow demolished, I needed Summer cotton more than I had planned. The rainy wet Spring delayed crop planting. Cotton plants were noticeably smaller in some fields close to the apiary while the overall acreage seemed about the same. The Summer had plenty of rain, and nectar production seemed normal.

I transported some of my lighter colonies by hefting them in the apiaries on the morning of the move. In several trips beginning around July 20, 2016, I moved 14 three-foot hives, five two-foot hives, and tested out future logistics by moving just two five-foot hives (see Figure 7). For the three-foot hives, Table 2 has the same layout as Table 1. The initial hive weights were mostly low because of the Spring rains. Notice Hive 6, its initial weight of 49 pounds, had a sizable gain of 84 pounds, something like Hive 39 at 93 pounds. Although Hive 4, its initial weight of 46 pounds, had a gain of 53 pounds, good, but it was substantially lower than both Hives 39 and 6.

Going out to cotton, the three-foot hives weighed 926 pounds total and their average initial hive weight was 66.1 pounds, noticeably less than the initial average hive weight of 71.2 pounds in 2015 (including Hive 39 since similar light-weight hives were included in 2016).

When I hauled the three-foot hives home in October, together they weighed 1800 pounds, almost a ton. Their average hive weight was 128.6 pounds. By inspection, the

Figure 9. *Loading hives, headed for home. (Lower) Three three-foot-hives fit across the front of the truck bed. Two five-foot hives hang a little over the tailgate. (Upper) The bee net wraps around the hives.*

2016 average weight gain of 62.4 pounds seemed similar to the gain observed in 2015 of 60.75 pounds (using the lower average). Rounded to the nearest pound, the result is 61 versus 62 pounds for 2015 and 2016 respectively.

Therefore the expectation seems to be so far in the data, three-foot hives without multiple harvests have a gross weight gain in the low 60s pounds. (Warning: Many of these hives were not empty enough to measure their full possible weight gains. For example, an 80-pound hive cannot gain 93 pounds like Hive 39 did because 80+93=173 pounds. That is way over the 150-pound limit. So the low 60-pound estimate is a very conservative estimate, meaning most likely the actual value is much higher.)

In actual top-bar hive management, the beekeeper should conduct a multiple harvest during the flow, but I wanted to weigh the hives intact. When the hive begins to become full, I expect a crowding effect to occur where the bees slow their foraging, something like a crowded colony before a Spring swarm departs.

My next goal is to repeat this observational study with five-foot long top-bar hives. Compared to the three-foot hive, the five-foot hive adds two feet of honey storage space at the rear of the hive or room for about 14 more honeycombs. The five-foot hive should remove the foraging decrease due to a "full" hive effect.

These five-foot hives can weigh up to 250 pounds. I think they are actually easier to move. The lifting temptation is gone, and one must be clever and use leverage. I move them routinely between my research apiaries. Getting them up on the scale for weighing is a logistical difficulty for one person. I picked two five-foot hives with small colonies, initially light-weight hives, because I needed to confirm the logistics of collecting

Figure 10. *Extra equipment, tied down, finishes the load. The amber rotating light up on the truck cab keeps away most of the tailgaters and road ragers on the interstate.*

weight-gain data, but not yet on long cement-heavy hives (see Figure 8). (The final weights of Hives 5-1 and Hive 5-2 were just 165 and 142 pounds respectively.)

After the data collection, I loaded up the hives (see Figures 9 and 10) and hauled them to their home apiaries. My plan is to return to cotton with more five-foot hives with Hive 39 colony conditions, aiming for 100-pound gains. Even Hive 5, with its 85-pound gain, suggests this goal is feasible. Strict management for honey production could bring these uncommon high gains (85 and 93 pounds) to become more uniform throughout the hives. And if achieved, I would not be the first. Abrol claimed annual honey crops from well-managed top-bar hives of 110-265 pounds under Asian beekeeping conditions (Abrol, 2010).

With a larger operation, more hives, perhaps we can begin to achieve honey *by the ton* from top-bar hives.

(For more pictures and updates go to **TBHSbyWAM.com** and click the link titled "Top Bar Hives and Honey Production.") BC

Acknowledgments

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Visit **TBHSbyWAM.com**

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A 'Net Gain' Cell Building System

Joe **Latshaw**

Queen rearing is my favorite part of beekeeping and always has been. It does not require all of the heavy boxes and equipment associated with producing honey, but I am still able to see all of the intricacies of the entire bee hive at work. There are perhaps as many queen rearing and cell builder systems as there are commercial queen producers. It has been my good fortune to visit with many queen producers and have the opportunity to speak with them about their systems. It is interesting to learn the details, the how's and why's of their systems. From those encounters I have developed a system that suits my operation.

Producing queen bees is resource intensive, especially the larger the operation becomes. A surplus of young bees and brood, or bulk bees and brood as they are called in the commercial setting, are collected from donor colonies. Such resources are a valuable necessity to any queen producer. The bulk bees and brood are used to stock cell starters, cell builders, bank colonies and mating nucs. All can place a great strain on the support system for resources. I think this hunger for resources stems from the belief that colonies need to be big, strong and populous to produce queen bees, especially the queen cells. For many years I subscribed to this train of thought, but quickly found I was too lazy to be a "good" queen producer with such a system. I did not enjoy managing 10-frame, three story deep cell builders or shaking bulk bees and collecting brood to boost them. So like any lazy beekeeper, I began looking for an easier method – without sacrificing quality.

Admittedly, good quality queen cells can be produced by brute force methods utilizing lots of bees. It has been successfully demonstrated many times over and it certainly works. Many large queen rearing operations rely on such systems, and they certainly work but devour resources. But if you look a little more closely at the entire process, there is a subtle beauty to the honey bees' methodology. A little finesse opens up many possibilities. I prefer to use queen right cell builders as I think they do a nice job of producing quality cells, but the challenge for me has been getting them "just right" to produce quality cells over a longer period of time. The queens I produce are destined to become instrumentally inseminated breeder queens, so I need a system that churns out good quality queens over a 10-week period.

A slight modification in the cell starter. Using a polystyrene nuc and a feeder rim, the newly grafted cells can be elevated slightly above the top bars. This works best when temperatures are warmer. During the cool Spring, put the cells down in the brood nest.

A top view of three newly grafted cell bars placed above the frames in the cell starter. After approximately 24 hours in the cell starter, I can pick up the three bars of started cells and transfer them to a cell builder or wait another 24 hours to transfer them.

Cell builder nucs ready to make cells, bees, brood and honey. Note the cell builders are not heavily "bearded" with excess bees.

The population or density of the bees inside the cell builder is comfortable, but not overwhelming. This picture shows the top box where the started cells will be placed.

My Ah-Ha moment for such a system came when I realized that a steadily growing average colony was a very good colony for producing cells. This point is important. The stage in a colony's physiological development a couple of weeks or so prior to when they would naturally start producing cells on their own for swarming is an ideal colony for producing quality cells. Consequently, my next question was how big, or rather, how small could such a cell builder colony be and still do a good job?

I decided to try five frame deep nuc boxes since I enjoy managing the lighter weight nucleus colonies that seem to grow quickly. I had plenty of boxes on hand and just needed to work out the details of managing them as cell starters and cell builders.

A queen excluder is placed between the second and third story to keep the cells safe in the top box. Screened bottoms are used to help with temperature control and vent holes are placed in each box to allow drones to move freely, especially out of the top box.

Before I get into the details, I should be clear that I still need some bees and brood for this system, but far less than traditional systems. My basic system uses a queenless deep, five frame starter hive. It is free flying which means the nuc is open and the bees are allowed to forage naturally. Some starter systems use "closed starter boxes" where the bees are confined while the cells are started. In my experience, a closed starter system requires more hands-on maintenance and attention. Therefore, I prefer to use a free flying queenless starter because I consistently get a high percentage of cells started in a queenless nuc. However, any queenless nuc is unstable and ultimately a drain on resources as there is no laying queen to regenerate the brood in the box. Once the cells are started for 24-48 hours, they are transferred into a queen right cell builder, the deep, five frame cell builders. Up to this point, my system is not all that different from traditional systems.

Keep in mind, I am located in central Ohio and our optimal cell building period is May thru June. Cells can be produced on either side of this window, but that is the optimal time for producing high quality cells without a lot of difficulty. Starting in April, I carry extra nuc boxes on the truck with four drawn combs in them. While making the inspection rounds in the bee yards, I am looking for overly populous colonies that need some thinning down. When I find an overly populous colony, I go through it to locate the queen to set her aside and then pull three frames of younger brood and a frame of honey/ pollen. I put these frames in the nuc. The fifth spot in the nuc is left open for a grafting frame that I will add later. I then shake in another two to four frames of bees, depending on how many bees are on the frames. I want enough bees in the box to fill the empty space where the grafting frame will go. The bottom of the nuc is screened, so I put the top on and in the truck it goes. This point is important. Moving the cell starter to another yard ensures that all of the bees I put in the starter will stay.

At this time if you simply want to raise 20-40 cells once, maybe twice, you are ready to graft. You can use this cell starter to start and finish a batch or two of cells for you. The queenless cell starter is ready to accept cells as soon as I get home. It may only be an hour or two later, but the bees quickly realize they are queenless. By giving the cell starter cells soon after they are set up, it diminishes their tendency to start emergency cells on the comb.

A slight modification on this system, again for the "lazy beekeeper" in me, is to fill the five frame nuc with frames, place a shim or feeder rim on top of the nuc, and then place the newly grafted cells on the top bars as shown in the pictures. This is only possible when the temperatures are warmer, and to facilitate this method I use polystyrene nucs that provide added insulation. By placing the cells on the top bars, I can quickly inspect

and remove cell bars without much disturbance to the colony. For me, it is more about speed and efficiency.

If your objective is to raise successive batches of cells on a consistent basis then there are some additional steps to the system and this is ultimately where the concept of the "net gain" comes into play. Prior to the start of queen rearing season, I build up my nucleus cell builder colonies to the point where they are three-story, five frame nucs nicely filled with bees. The system I use was developed over many years to accommodate my need for a steady weekly supply of queen cells. I typically run six cell builders and this will easily provide me with 150 or so cells per week. I can adjust the number of cell builders up or down, but generally work in multiples of "3". Three cell bars fit on a grafting frame in the cell starter. One started bar of cells is then given to each cell builder. My goal is quality because in all of the years I have been raising queens, my records show that quality starts in the cell builder and pays dividends the rest of the queen's life. The cells I produce are then destined to become instrumentally inseminated queens. Again, quality is important and the number of cells I produce each week is later tied to the number of queens I will have to sit down and inseminate a couple of weeks later. Once the system is up and running, it just keeps plugging along with a little time and management on my part.

Growing the nucs early in the season, in order to take advantage of some early queens, also requires a little care and attention on my part. The nucleus cell builders are fed and equalized in order to keep them all in a similar state of growth so that they can be managed collectively as a unit. In my case, all six cell builders should be at the same physiological state of growth. Colonies progress through the season at different rates, but with a little management they can be held in sort of a suspended state of constant growth. The target point I aim for is a young populous colony a couple of weeks before the initiation of swarming preparation. Once a colony initiates its own swarming development, it is not of much use to me as a cell builder. It is as if they have gone too far. Even if I allow them to swarm or even split them and rebuild them with brood and bees

One bar of started cells is given to each cell builder. I use an older design for my cell bar frames in the cell builder colonies. Note the comb in the upper portion of the frame and the single bar of cells at the bottom. This design helps to keep the cells in closer to the brood nest area which is of greater importance during temperature extremes.

from another colony, the remaining bees still have a greater propensity to swarm again and will often do so. It is as if they have made up their mind and there is little I can do to distract them from the urge to swarm. In my experience such colonies are less than ideal cell builders.

Keeping the cell builder from crossing over into that swarming impulse is key. Each season is different and each cell builder is different. There are a couple of primary factors that seem to "send them over the edge" so to speak. In the early Spring, temperature and incoming nectar appear to be the two main factors I contend with. The past couple of Springs we have had some cool wet periods punctuated by temperature spikes up near 90 degrees. This seems to drive me and the cell builders nuts! The best I can do is watch the forecast and make sure the cell builders have adequate room to expand on those warm/hot days. The warm days sometimes coincide with a spike in nectar availability if it is late enough that plants are blooming abundantly. It really is a balancing act to get the "goldilocks" scenario of just right. Screened bottom boards certainly help as I can close them if it is cold and open them when it is warm.

More specifically, as the ratio of older adult foragers increases relative to the number of young nurse bees, the colony progresses more towards swarming.

As the cell builder colonies begin to fill out their space, this is where the management and "net gain" starts to add up. It took me many years of trying to figure out how to keep a colony just right for building cells over the course of our spring season. Rather than adding bees and brood as is common practice with other queen rearing systems, I need to remove bees, brood and honey with my system. But what bees, brood and honey need to be removed in order to keep a colony in a constant state of growth to maintain that sweet spot for producing cells? From my experience, the field bees are the so called "trouble makers" that cause the colony to age. More specifically, as the ratio of older adult foragers increases relative to the number of young nurse bees, the colony progresses more towards swarming. Therefore, my goal is to maintain a nice balance of foragers and younger nurse bees weighted towards the younger side.

In order to accomplish this delicate balance, my nucleus colonies

Three days after grafting, it looks like the cell builder is doing a nice job with the cells.

Five and a half to six days after grafting the cells are finished. Note the royal jelly fills the entire based of the plastic cell cup. These are well fed cells.

are put to work raising cells just as soon as they are physiologically mature enough to do so, which appears to be when they fill 80-90% of their space in the colony. They are not packed or crowded but comfortable. They have the bees and the resources to care for their brood as well as some excess cells. To keep them at this point I begin managing the cell builders on a weekly basis. I want them to direct extra resources towards the cells on the cell bar and not their own cells on the combs.

Again the cell builders are growing colonies, and as they grow they are managed according to their needs and growth. Some will grow faster than others and resources may initially be swapped back and forth between cell builders, but soon they will all be producing excess brood, bees and honey. To effectively remove the troublesome foragers, I visit the cell builders as early as possible in the morning to ensure that most of the field force is still at home so that I can accurately judge the population density inside the colony. Equipped with extra nuc boxes and drawn comb, I start at one end of the cell builder yard and work my way through the six cell builders, re-working them for another seven days of service. As I work through the cell builders, I remove extra frames of brood and honey, preferably from the bottom box or the outside frames of the second story. These areas are abundant with older foragers that are awaiting their foraging duties for the day. When the weather is warm and resources are abundant, the cell builders grow rapidly. Many weeks, the cell builders can spare two frames of brood and two frames of honey. This is approximate and subject to the condition of each cell builder. Early in the season, I use the excess brood and bees to start new nucs with a frame of brood and a frame of honey, so this effectively produces two new nucs per cell builder per week. If resources are light, I stimulate the cell builders with a light syrup and pollen patties in an effort to keep them growing and moving forward.

Finished cells.

In our area of the country, black locust trees generally bloom the middle of May. One would initially think that a good nectar flow would be great for producing cells, but the opposite is true. A strong honey flow wreaks havoc on the cell builders. The bees are all consumed with hauling in their bounty, and rightfully so. The cell builders are overrun with nectar and cell quality suffers. At this point I find it is best to suspend cell building for a week or at least accept that I will have to work harder. I do my best to provide extra room for the deluge of nectar and maintain some sense of sanity in the cell builders. It is a great time to give them an extra honey super with drawn comb and maybe a little bit of foundation. I am just trying to appease their need for space until the nectar deluge subsides. A mild nectar flow is great for building cells as it has a stimulatory effect, but a flow such as the black locust flow can be counterproductive.

As I work through the cell builders, I rearrange brood and resources. Full frames of honey are moved to the bottom box on the outside, and sealed frames of brood are also moved down to the bottom box. They will then be in the proper place and covered with older foragers the following week. Drawn empty

QUEEN QUALITY REPORT

Source	Received date	No. queens
KM	08/18/14	14

Morphological measures

A+	Weight (mg)	Thorax width (mm)	Head width (mm)
Average	208.1	4.9	3.9
Maximum	224.8	5.14	3.96
Minimum	187.9	4.56	3.78
% GLOBAL	68.8%	97.1%	93.7%

If you would like to see how the quality of your queens compares to other queen rearing operations, NC State Apiculture Program and their Queen Quality Clinic offer some great services to beekeepers! Above is a comparison for a group of "banked" Inseminated Queens (from later in the season) I submitted for analysis. The weight was relatively low due to banking the queens, but their thorax and head width, which do not change with egg laying status, were great. At the time when these queens were submitted, the "global averages" of 682 queens sampled by the Queen Clinic were Weight = 195.9mg, Thorax width = 4.47mm, and Head width = 3.55mm. These queens surpassed all of the global averages.

comb is then placed in the second story where the queen spends a good deal of her time. Foundation will not work at this point, most years. Drawn empty comb will keep things moving along more smoothly.

Since the cell builders are three deep nuc boxes tall, the middle box is well insulated from temperature extremes and the queen quickly fills the empty combs. Perhaps the most important part of this inspection is to remove any unwanted queen cells and to rearrange the third story where the cells are produced. The top box is separated from the queen right portion below through the use of a queen excluder. The top box is provisioned with a frame of honey on each outside wall followed by a frame of young open brood on each side and an open spot in the middle for the grafting frame. There is some debate as to whether open brood detracts from the quality of the cells, but in my opinion it is highly beneficial. Young open brood not only attracts nurse bees, but it also serves to encourage closer regulation of the temperature in that nurse bees attracted to the young brood help to maintain a more constant temperature and humidity level surrounding the cells.

Frederich Ruttner explained it best when establishing queen rearing colonies. He stated that the bees needed to "learn" to build cells. Perhaps "conditioned" would be a better term, but in my experience, some colonies need to be transitioned into raising cells, but once they get in the correct mood or mindset, keep them working! Provided the cell builders have a continuous supply of grafted cells to work on, their rogue cell production should be minimal. If not, something is wrong and they may be too far gone with the idea of swarming. Once I get into the weekly routine of working the cell builders I can give them started cells about every four days. In my experience, cells are sealed approximately 5.5 days post grafting. This varies slightly depending on colony conditions and between cell builders, but the idea is to keep the cell builders doing what they are designed to do, build cells. In addition, by confining the cell builders to a relatively small space with vigorous queens, you are effectively generating excess brood, bees and honey from the system to establish additional nucleus colonies throughout the queen rearing season. Happy grafting this season! BC

> *One would initially think that a good nectar flow would be great for producing cells, but the opposite is true.*

Joe Latshaw is a commercial queen breeder and producer living in Central Ohio.

Leave The Flying To Us

Jennifer **Berry**

Moving Bees Is Stressful For The Bees, And The Beekeeper, Almost Always

Sitting at an airport is one of my least favorite activities. Actually, that's not true. Sitting at the airport, waiting nervously for my number to be called, being shuffled down the gang plank and stuffed into a metallic tube that's about to shoot tens of thousands of feet into the air, and then flying on the airplane – that's what I like the least! Now, I'm not one of those folks who have unsubstantiated fears, genetically linked or otherwise. Nope, there is a reason I hate to fly. Years ago, I experienced a flight that scared me to such a degree that I haven't been comfortable flying since. You're probably not in the least bit interested in what happened, but, on occasion, it helps for me to talk it through. Think of it as a sort of therapy. But don't worry; I will spare you the details and stick to the short version.

I boarded a plane in Texas headed toward Missouri. My seat was in the front next to a nice woman who wasn't as used to flying as I was. Across from her, was a pilot who had flown more times than I've inspected my hives. We didn't really get to know each other, because as the plane taxied down the runway my attention was focused on an intense thunderstorm barreling down on us from the west.

It was early in the morning, but the sky was black. The wind jerked the trees in the distance back and forth like bobble-heads, and dust and debris tumbled in swirling streaks past the window. Lightning forked sporadically across the horizon, touching ground here and there and blinded us passengers.

The plane came to a stop at the end of the runway. I (along with the rest of the passengers) breathed a sigh of relief, thankful that the captain had come to his senses and decided to wait till the storm blew over. But NOOOOO! After only a few seconds of comforting assurance, the engines revved, the flaps went up, the brakes released and off we went, barreling toward the beast.

Right as the wheels released their grip from the tarmac, the plane was cold-cocked this way and that by the strong gusts of wind. The turbulence was the worst I had ever experienced, but we kept climbing, into the churning bowels of the storm.

The woman next to me gasped for air and squealed with each bump, obviously terrified. Fortunately for her, the pilot who sat across from me very calmly explained to her that there was nothing to worry about, that "flying was very safe," and that "these planes were built to handle much worse turbulence." He went on to describe what turbulence was exactly. His soothing voice not only seemed to help reduce the numbers of squeaks next door, but also began to put me at ease as well. But I couldn't stop my teeth from rattling out of my skull. I took slow, deep breathes and relaxed the death grip I had on the armrest. That combined with the pilot's logical calm explanations made a difference, until…

Suddenly, out the rain-streaked window, a brilliant flash of light and a loud snapping noise broke through the darkness. A single crack, a loud bang, then a cacophony of sounds exploded all at once. The plane took a nosedive. Overhead compartments flung open, and purses, baggage, and coats that were held within poured out into the aisle. But that wasn't even the worst part. As the screams of my fellow passengers drowned out the crunch of the engines struggling to bring the plane back to horizontal, the face of the pilot across from me became white as a ghost. The man who had assured us that there was nothing to worry about, was screaming at the top of his lungs.

That was when I thought – when I accepted – that we were going to crash. And just as my heart felt like it was going to burst into a thousand tiny particles, the plane began to level off. The screech from the engines calmed, the screaming from the passengers faded into quiet murmurs, and normalcy returned.

Moments later, the captain announced over the intercom, his adrenaline obviously still pumping, "Ladies and gentleman… we're going to be okay!" The passengers and I (and even the pilot across from me) erupted with applause. The unmistakable laughter of having just cheated death overwhelmed the fear we once had just moments ago. Sunlight peeked through the clouds and flooded the cabin. The woman next to me who had nearly broken my hand from holding it so tight hugged my neck so hard I could hardly breathe. And the pilot across from me, well, the color returned to his face along with a big ole smile.

We landed in Houston 20 minutes later. I never wanted to fly again, but I still had to make it to Kansas City. I turned right back around get on another plane, which, by the way, experienced heavy turbulence for the duration of the flight. Not a good day for me or my newly established fear of flying.

Nucs being loaded on the trailer.

Nucs on the trailer.

Traveling can be hard on us before, during, or after, no matter if we're flying, driving, or taking a train. There's the stress of planning, the packing, making arrangements for our pets, yards, and work, the travel itself, the amount of work waiting for us when we return, and what else? For me at least, no matter if I'm traveling for vacation or work, there's always stress involved. The bright side is that my entire house isn't being picked up and moved to a new location! Think about what it must be like for the bees when their home is relocated. All of a sudden, their entrance is blocked, there's rumbling noises outside, a bang here, a bump there, then, whoosh, their entire home is floating through the air, swaying back and forth. There's another loud thud, some more banging, bouncing and thumps. Next, there's a roaring sound, and a constant shifting to the right and left, with occasional rattles and rumbles. Finally, the roaring sound ceases, then more bouncing, bright light floods into the hive and then… quiet (kinda like that flight I was on).

Each year, millions of packages and nucs are sold and redistributed across the United States (which equates to billions of bees). Bees are also moved for pollination contracts (like almonds) and honey production. And each year, these billions of bees are either shipped or hauled, eventually landing in an apiary or someone's backyard. Packages, at one time, were the most common way to purchase bees, especially for beginners. Back in the good ole days, you could open your Sears catalog and order a package of bees. Then, once the screened box (full of bees and a queen) arrived, you'd just dump them into the hive box and let them get to work. How convenient.

Nowadays, packages are still the number one way bees are sold, but nucleus colonies are gaining in popularity. A nucleus (or nuc) consists of five frames of bees, brood, honey and pollen, and a laying queen. The main difference between a package and a nuc (and why we recommend nucs especially to beginners) is that nucs already have frames of drawn comb with brood, stored honey, and pollen. Instead of just the bees, you are purchasing a mini hive; hence nucs have a leg up on packages. The only downside to purchasing nucs is they're almost impossible to ship, unlike packages. And moving bees, can be extremely stressful for the bees and beekeeper, which we'll discuss here in a minute.

Another stressor is supplying nucs to beekeepers. You have to anticipate how many nucs you think you'll be able to provide eight months prior to supplying them. We start taking orders for nuc sales in August, and are usually sold out by December. Over the years, we have been pretty good about estimating the number of nucs our colonies will be able to supply. The problem, however, arises when you take too many orders and you can't fulfill them. For example, say we took 100 orders for nucs in August but were only able to deliver 80 in March/April: not good. By December or January, most operations are already sold out. Hence, if we (or other nuc suppliers) fail to deliver on our promise, our customers may not be beekeeping that year. Not a good feeling to let folks down, especially when they are relying on you. So, yes, I would say that's the most nerve-racking part of raising nucs, making sure you have enough healthy bees and kick-butt queens to satisfy all your customers.

Timing is another issue too. Most folks want their bees as early as they can get them to take advantage of the nectar flow. However, Mother Nature (and the bees) are the ones in control. An extremely cold Winter or an early warm spell can wreak havoc on production. Nucs that leave our operation must have at least three to four frames of bees and brood, and one to two frames of honey and pollen. The bees and brood are usually not the problem; it's the amount of incoming nectar. Fluctuations in weather patterns (warm to cold, dry to wet) can reduce how much nectar is being converted to honey because more nectar may be consumed than stored. You never know what the weather will do in February and March. Warmer weather encourages more brood production, which will evidently lead to bees consuming more food. In colder or wetter weather, the bees aren't able to get out and collect the necessary food they need to support the growing population. We end up having to feed them so they won't starve. That is why we won't release our bees until they have plenty of food (nectar that is) to get through any future dry spells. Another issue that can cut down numbers dramatically is swarming, but that's for another time.

After we've managed the bees, taken the orders, evaluated, fed, kept from swarming (or at least tried), hived the nucs, evaluated again, and talked to customers, there's just one final item left. That's the one that always raises my blood pressure: preparing and moving the bees to their new home. Transporting bees, whether a nuc traveling a few miles in the trunk of a car or a tractor-trailer loaded with hundreds of full size colonies for several thousand miles, is not an easy task. Precautions need

Jim and James ready to load the bees into the jet.

Girls locked and loaded.

to be taken for the safety of the bees and the beekeeper (plus those innocent bystanders in the interim that may encounter bees as well). There was a minor incident the first year we sold bees. A gentleman showed up with his own equipment, so we had to transfer the frames into his box. No big deal, right? Normally, it wouldn't be, but as he was putting his ill-constructed hive into the back seat of his Mercedes Benz, the bottom board slid to the side, and out poured several hundred bees. Big deal, right? While he didn't seem too concerned, he kept his veil on the entire ride home.

Now that's just moving one hive. Imagine hauling several hundred nucs over several hundred miles. That's exactly what my good friend and beekeeper extraordinaire Bob Sears does. Each year, the Eastern Missouri Beekeepers Association, situated in St. Louis, MO orders several hundred nucs from Merrimack Apiaries, located in Bunkie, LA. One of Bob's many jobs is to drive down and haul 200 nucs back home for the club members.

It takes roughly 12 hours drive time, door to door, along with a hefty truck and trailer and nerves of steel to retrieve all the bees. No problem, but once the trailer is loaded and the bees are covered in a custom made net, there's no dillying or dallying allowed; it's straight home, only stopping for gas and the much needed pit stops.

Bob does try to make it somewhat of an enjoyable trip for both himself and the bees. He provides plenty of ventilation in the truck since bees can overheat quickly, especially during the day. And he doesn't stop often; he splits the drive into two days down and back, sticking mostly to the interstate because there are more services available than on some backwoods, country roads. But more importantly, Bob rewards himself with some awesome BBQ in Jackson, MS. Once back home with the bees, the nets are removed in the dark, and members of the bee club start trickling in around 6am to collect their new pets. To date, Bob hasn't lost a nuc. The only issue he's encountered is queen loss. So, when club members pick up their nucs, they usually pick up a few extra queens as well.

Other things can go wrong – terribly wrong – whenever bees are being moved, so care must always be taken. Probably the best advice that I've received over the years

from seasoned beekeepers is, “Don’t get in a hurry, and take your time!” Always make sure that the lids to the hives are firmly fastened, and the hives are ratcheted down and secured to the vehicle or trailer. Hives tipping over or breaking apart is not good for the bees. And trust me, the bees will let you know, each and every one of them, just how bad it is!

As we just described, moving bees on trucks and trailers is the usual way folks move bees from point A to point B. So, when a dear friend of mine, Jim Gross, contacted me about purchasing nucs, I didn’t think too much about it. Jim, who lives in Nantucket, wanted two nucs for himself and two for his longtime friend, James Shondel, who lived in Charleston, SC. They’ll just drop the nucs off in Charleston with James, and then Jim will continue north with his nucs. No big deal, right? Well, there’s a fun twist. The plan was, they were going to pick up and deliver their nucs in a private jet. James is a pilot and owns an Eclipse Twin Jet, which is perfect for hauling bees around (or for a family of six) since it’s fast and doesn’t need a huge airport to land. I thought: wow, now that’s cool! We should add that service to our business. Then our company slogan could read, “Jet Bees – The most rested bees since we do the flying for them”. Ok needs a little help!

We set a date for pickup and fortunately, there’s an airport close to Athens, GA, so it was convenient for both parties. When the day arrived, the weather couldn’t have been better: clear blue skies, perfect for bee travel. They called as they were leaving Charleston, which gave me an hour till touchdown. I picked them up so they could spend a few hours tooling around the bee farm. Then before it got too late, we loaded the bees into my very dirty work truck and headed back to the airport.

But the coolest part of that day was driving out onto the tarmac and loading four, double deep nucleus colonies into the belly of James’s jet. They were going to head back to Charleston and drop off two nucs for James, spend a few days, and then jet up to Nantucket and deliver Jim’s nucs. Both the guys and all the girls made it safely home.

Happy beekeeper with her new pets.

Now, that’s the way to move bees. By the time they were loaded, re-loaded into the plane, unloaded, and then placed into their new apiary, only a few hours had passed instead of an entire day of travel. Plus, the decrease in stress level for the bees was huge considering they were not bounced on a bumpy highway from county to county. However, if it were me, I’d still be uncomfortable up there in the air, especially if turbulence hit. Not only the thoughts of flights long past tumbling around my brain, but now I’d be concerned about a nuc cracking open, releasing a few thousand pissed off bees into the tight confines of the metallic tube. Maybe I should just stick to the ground.

Be good to you and your bees. BC

Got A Question?

Ask Phil

Phil **Craft**

He Knows!

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

A beekeeper in West Virginia writes:

I have always heard that you can't take honey from a hive until it has survived thru its first Winter.

From what I could tell, at the beginning of spring last year (first hive to survive in my five years of beekeeping) when I opened up the box after Winter, the bee volume was about half of one medium. I don't know if that was normal. They survived and then thrived so I didn't care.

My question is, when you get a nuc, it would seem to be the same size as my surviving hive, so why can't I take honey from them their first year? Why wouldn't they be able to produce their own honey stash after a regular honey flow like all other 1+ year old hives?

Phil replies:

I never tell beekeepers that they cannot take off honey from a first year hive – only that they should not expect to. Our goal for a young colony is for it to draw out all the frames in the desired number of brood boxes, increase in population, and have enough food stored by late Fall to survive the upcoming Winter. Excess honey for harvest is a bonus.

Frame with drawn foundation.

It's a step by step process. First you, the beekeeper, watch for the bees to draw out most of the foundation in one brood box (about eight frames out of 10) before adding another. Repeat until all boxes are drawn out. The typical hive consists of two deep brood boxes, but that can vary depending on climate and personal preference. Where Winters are long and severe, a colony might need three deep boxes to house the bees and the food stores it needs to survive until Spring. Then again, some beekeepers, like you, prefer to use mediums as brood boxes. In that case, three would be the most common configuration. The next step, after the top box is drawn out, is for the bees to fill it with brood, honey, and pollen. Only then, and only if there is still a nectar flow, is it time to add a honey super. If they draw that out and start to fill it with nectar, add another.

Whether or not a new colony produces harvestable honey in its first year depends on a number of factors. Was it started from a nuc or from a package? Nucs arrive with several frames already drawn, a queen that is laying, and at least some brood. To begin with a package is to start from scratch; package bees must draw out comb before the queen can begin to lay. Since there is no brood to start with, there will be a delay of several weeks before any new bees emerge. A rapid build-up is crucial to making the most of a spring nectar flow and is one of the reasons that many beekeepers prefer to begin colonies from nucs – when they can find them. It's also why timing is another variable in honey production. How early in the Spring was the new hive established? The earlier the better in terms of build-up, but temperature is a limiting factor, leading to the next question: in what part of the country is the new hive located? In Florida beekeepers start new hives in January, but in northern Michigan it isn't safe to do so until late May or early June. Regional location also dictates factors such as length of the nectar flow, dearth periods, and length of day. In North Dakota, for example, the growing season is short, but the days are long and bees forage nearly from dawn to dusk. The final factor is luck. Was it a dry year with little available nectar? Did it rain throughout most of the blooming period so that the bees were unable to fly and forage? Clearly, with so many variables affecting the chances of a first year harvest, there can be no hard and fast rule about it.

Congratulations on successfully wintering a colony for the first time. If it makes more honey than it needs this year, don't hesitate to take your share. Some people call it robbing the hive. I call it charging rent.

A customer in Kentucky writes:

A couple of weeks ago I purchased eight jars of your honey from the IGA in Wilmore. My intention was to mail them to family members as Christmas presents. However, the honey is now a solid mass. Is it okay? How do I get it back to the way it looked before. It was such a pretty amber color. Whatever happened?

Phil replies:

The honey is perfectly okay, but if you want to understand what happened, you'll have to be patient while I go into a little chemistry. Honey is basically sugar, but it differs from table sugar in a couple of important ways. First of all, table sugar consists of sucrose – just sucrose. Honey is a mixture of "ose"s, predominantly glucose and fructose, with trace amounts of minerals and other ingredients such as acids. More importantly, if you look closely at the sugar in your canister, you will see that it is made up of tiny, dry crystals. Most honey is sold as a liquid containing up to 18% water, but it's what scientists term supersaturated. The definition of a supersaturated liquid is one which contains more dissolved solutes (in this case the sugars) than could be dissolved in normal circumstances. I like to say that it is a liquid yearning to return to a crystalized state, and sometimes, as in the case of the jars of honey you bought, it does.

All types of honey will crystalize under the right conditions. The reasons that some do so more readily than others, are complicated. It depends partly on the exact composition of the nectar from which the honey was made, which in turn depends on the floral sources from which it was collected. Just as flower varieties, growing conditions, and time of year affect the color and taste of honey, they also influence its tendency to crystalize. Another factor is the size and number of small particles in the honey. Crystals need a substrate on which to grow, and tiny grains of pollen or flecks of wax provide one. They have been removed through heating and pressure filtering from the honey sold by large packagers, which is why the jars you buy in the grocery store are rarely solidify. Typically the honey sold by small scale beekeepers, like me, is less processed and therefore more likely to contain some pollen. Many people feel that it improves flavor and some believe that eating it alleviates allergy symptoms, but it does, indubitably, promote crystallization. Temperature is an even more critical factor. Honey crystalizes most readily between 50° and 60°F. Warmer storage conditions make the transformation less likely and, counter intuitively, jars of honey can be kept frozen indefinitely and then thawed without affecting its consistency.

Crystallized, and not crystallized honey.

Enough of chemistry class; your question is what to do now. When jars are gently heated to a temperature between 105° to 115°F, honey will revert to a liquid state. A hot water bath is the best method, but care must be taken to keep plastic jars from direct contact with a heat source. Alternatively, the honey could be enjoyed as it is. Many beekeepers sell creamed honey, which is made by a process of controlled crystallization. Some honeys, such as canola, crystallize so readily that they are virtually always sold creamed. In fact, in many countries solid honey is the norm. In whichever form you prefer it, honey is good eats.

If you stop by my house, I will swap out the jars that have crystallized for some that are still pretty amber.

A beekeeper in South Carolina writes:

I enjoy your practical answers in Bee Culture. I was hoping you could answer a couple of questions.

I live in South Carolina and the winters are comparatively 'warm'. I just started beekeeping and completed the Beginner Course in January-February of 2016. While many people in this area insulate the top of their hives and put a cover below their screened bottom boards, I have not talked to anyone who actually insulates their hives. If I were to follow the pack and insulate the top and put a cover below the screened bottom board AND put R-3 insulation on the sides of the hives (making sure to keep the notch in the inner cover clear for ventilation), would I create a problem for the bees?

I noticed something disconcerting today. It was overcast and ~50 degrees today. I watched a yellow jacket (they've been especially bad this year) land on the landing board and after several seconds walk into the hive. I expected to see the yellow jacket exit the hive pursued by guard bees. I did not see it exit after about a minute. Should I be particularly concerned or is this something that happens now and then?

Phil replies:

With the exception of those in the far north, beekeepers in the United States do not find it necessary to insulate their hives during cold weather. The only physical modification that I recommend for winter is the installation of mouse guards. A warm, dry hive can be an enticing refuge for mice. Beekeepers who fail to take precautions (and I admit to being one of them from time to time) may find nests, damage to comb, and sometimes mice themselves in their hives come Spring. Mouse guards, or entrance reducers as they are also called, often consist of solid blocks of wood which fit in the hive entrance and restrict it to an opening that a mouse cannot get its head through. Unfortunately, some beekeepers have the mistaken impression that the purpose of entrance reducers is to help keep the hive warm by restricting reducing drafts of cold air. In fact, as from your question you seem to be aware, good ventilation is just as important in winter as it is in Summer. That's why I prefer (when I do get around to it) to use mouse

Asian hornet.

guards made of perforated metal strips which effectively block mice, but do not impede the flow of air. A colony is capable of dealing with cold temperatures, but is stressed by the cold, wet conditions created in a poorly ventilated hive.

Though honey bees are cold blooded animals and therefore not individually capable of thermoregulation (meaning that they cannot control their own body temperature), collectively, they use an impressive array of strategies to regulate temperature within the hive. In Summer, they deposit droplets of water throughout and fan them with their wings. As the drops evaporate, the change of state produces a reduction in temperature much as evaporating beads of sweat cool our skin in hot weather. At the approach of cold weather, the bees "caulk" unwanted cracks and openings in the hive (whether it be a brood box or a hollow tree) with propolis produced from resin and other plant material. Every beekeeper who has ever used a hive tool to pry two boxes apart knows what an effective sealant propolis makes. The key to winter warmth, however, is the cluster. When the interior temperature reaches the mid 60s, the bees have already formed a loose ball to share body warmth. The cluster shrinks as it becomes colder and the colony huddles closer. Meanwhile, some individuals flex their thoracic muscles to produce heat in an action that resembles flying in place. By the time a thermometer placed in the hive would read in the mid 50s, the cluster consists of a compact shell of stationary, flexing bees and an inner core where individuals can move about on the comb and feed. The shell can be several layers thick, made up of bees with their heads facing inward. Workers change positions, rotating between the shell and the core, but the queen stays always in the sheltered center. In this way, by muscle contractions, by expanding and contracting the cluster, and by increasing or reducing the number of bees in the shell, the colony can maintain a temperature of about 68°F within the cluster even when it's well below freezing outside. Pretty amazing!

Honey bees are also, in most cases, self-sufficient when it comes to protecting themselves against carnivorous, predatory insects. Yellow jackets, hornets, and cicada killers, all of which are actually wasps, will attempt to prey upon colonies. In tropical countries these (and one species of Asian hornet, especially) are a serious problem. Most predation in the U.S., however, is by hornets and non-wasp insects such as damsel flies, dragon flies, and a particular species of praying mantis, and it tends to be by individual insects. Our hives, for the most part, do not experience the mass attacks which take place in other parts of the world. Europe, for instance, has not been so lucky. Since they were accidentally introduced in France about 10 years ago, the Asian hornets (*Vespa velutina*) have created consternation amongst beekeepers there, and have since spread to nearby countries. Their modus operandi is for several dozen hornets to wait at a hive's entrance and bite the heads off bees as they emerge. After killing and eating most of the adult bees, the predators can finish robbing out the hive. On a couple of recent visits to France I have seen Asian hornets around bee hives, though each time it was only a single insect. On both occasions it was quickly dispatched by the beekeeper. As an alternative to individual assassination, many beekeepers now use hornet traps. These are not generally marketed here because *Vespa velutina* has yet to cross the ocean.

In the U.S., mass attacks are usually perpetrated by yellow jackets, especially in the late Summer, and Fall. They are after the dead bees, including drones, which tend to accumulate around the entrance, though they will rob hives for honey as well. I have occasionally seen them in my colonies, but they have never posed a real problem. Some beekeepers do report serious raiding and robbing of hives by groups of yellow jackets, the colonies most at risk being those which were already weakened from other causes. Other than maintaining strong hives, I can only suggest yellow jacket traps for large scale or persistent problems. There is a lot of, mostly reliable, information about them available on the internet. A few dozen of the pests can be dealt with most easily by squishing them with a hive tool or even a finger. (Do this last quickly. Take my word for it.) However, I am certain that your single yellow jacket was not a threat to your bees, and should not be of concern to you. A honey bee colony is well prepared to defend against a single insect predator. One common defense is balling: a number of bees surround the invader and flex their wing muscles, just as they do in warming the cluster, and literally kill by overheating. Then there is always stinging. Either way, I'm sure the intruder was quickly dispatched.

I give you full credit for being a conscientious first year beekeeper. By taking classes, talking to beekeepers around you, asking questions, and noticing what is going on in your hives, you're doing everything right. But give the bees some credit too – they've been doing this for a long time. BC

Beekeeping 2025

Will hardly a decade really make that much of a difference?

James E. **Tew**

What's so special about 2025?

Well, being unable to foresee the future, I don't know of anything that will be special about the year, 2025. I was recently asked to present a discussion at a state meeting, and this was the topic on which I was asked to speak. The group wanted something pertaining to the near future rather than a look at beekeeping far into the future. I suppose some guesses can be made about the randomly chosen year – 2025. I want to see if I can look backwards – which at one time was the future – to see if I can see trends that will predict events eight years from today.

Those who are older, please help me out.

I am shocked to do the simple arithmetic and realize that I will be 77 years old in 2025. Simply stated – wow! But looked at another way, 16 years ago, I was 52. I have written in previous articles that those of us who stay in beekeeping become inexonerably incorporated into beekeeping. While you and I age, beekeeping evolves and changes into something "newish." We as human beekeepers just grow into older beekeepers. I got my first two hives of bees in 1973. That means I have – roughly – lived through three 16-year cycles. Maybe I can take selected beekeeping attributes from my first two+ 16 year cycles to shoot a trend-line out to 2025. *(Really – will anyone remember this article in 2025? What do I have to lose?)*

But first, some comments on predicting the unpredictable.

Sometime during 1946, two years before my birth, Dr. Percy Spencer[1], a scientist with the Raytheon Corporation, was researching radar technologies – specifically a vacuum tube called a magnetron. He noticed that a chocolate candy bar had melted in his shirt pocket as he was standing near the vacuum tube device when it was being tested. Sensing something odd was on going, he placed some popcorn kernels near the tube. Within a few minutes, popped corn apparently splattered all over his lab. Later he put an egg near the device to show a co-worker the effects of the magnetron. The hot egg exploded on the face of the curious on-looker. Could a device with potential use in radar technology instead be used to cook food in the average home kitchen? We all know the answer to that. The very first microwave was six feet tall and weighed 750 pounds.

In 1928, Alexander Flemming[2] noticed that a common mold *Penicillium notatum* destroyed colonies of *Staphylococcus aureus*. Though it had been observed innumerable times before, this casual observation was the beginning of the antibiotic era of medicine. Though others had noticed the mold's effects, until then it was only considered to be a laboratory contaminant.

On a much more mundane – but important to me – subject, some of the best advances I have made in my use of Power Point and Photoshop have been due to key stroke errors. I call them the, *"I didn't know that would do that."* moment. Spencer was not trying to build a new type of oven. Flemming was not trying to develop an entirely new medical concept. And me – I was just trying to get my talks ready for some future meeting. My point is that a lot of science and technology is highly predictable while a lot is simply blind luck – even mistaken luck. We depend on that unanticipated luck as a way to advance science. Though helpful, such breakthroughs are unpredictable. In this article, there is no way for me to predict such future blind-luck beekeeping happenings. Maybe I should just make some up.

Bee meetings in 1977, 1993, and 2025

1977: Beekeeping was enjoying a cyclic growth boom. People wanted healthy food with healthy sugars. I ate bean sprout sandwiches and had long, dark, slightly wavy hair. In fact, long hair was in style and angry bees loved it. New beekeepers wanted their own hives. Package bees and good quality queens were plentiful. Traditional beekeeping was a hot item. Local honey sold well. Attendance at meetings was good and was growing. Presenters used slide projectors or overhead projectors. Talks had to be assembled weeks in advance. Since slides could not be edited, audiences accepted the frequent bad slide as a way of life. There were no laser pointers.

1993: 16 years later, the *Varroa* mite was in the final stages of redesigning the bee industry of North America. Shock and dismay were common features of beekeeping as keepers thought they would never get either tracheal or *Varroa* mites. They had to accept the fact that their colonies would succumb to the mite invasion. Yet the public was fascinated by the concept of ***Killer Bees***. The public treated pollination and concern for all bees' welfare shabbily. But how could the public be blamed? Everywhere they were told that they would be stung to death by marauding killer bees. Beekeepers and landowners were concerned about legal issues.

In some instances, it was difficult

[1]Who Invented Microwave? http://www.todayifoundout.com/index.php/2011/08/the-microwave-oven-was-invented-by-accident-by-a-man-who-was-orphaned-and-never-finished-grammar-school/

[2]Bellis, Mary. The History of Penicillin. http://inventors.about.com/od/pstartinventions/a/Penicillin.htm

to find beeyards. Attendance at meetings dropped. Beekeepers left the industry. Numbers of both bees and beekeepers declined. From an income standpoint, honey production was still more important than pollination. In 1993, computers were just beginning to change the way programs are presented. The world-wide-web was still very young.

2025: Beekeepers as old as Jim Tew are still at meetings and still remember the old bee days of the 60s and 70s. But unfortunately, much of that old information is nearly useless. Most presentations are electronic and are streamed from the web in real-time with immediate feedback between the audience and the speaker. In fact, many of the older people – like Jim – don't actually attend the meeting but are there in electronic format. Actual attendance at the meeting is no longer required. Electronic devices that are a combination of today's cell phone, digital phones, virtual computers, and wristwatch/computer contraptions will be used to gather bee information and participate in virtual bee meetings. *(Honestly – much of this procedure could be happening now if a way of gathering registration fees could be generated. There will still be costs incurred in conducting virtual meetings, but presently most of us are accustomed to things on the Internet being free.)*

Varroa mites are still around but are not much of an issue. Enough time has passed that an improved relationship has developed between bee strains that are more mite resistant and mites that are more bee tolerant. Time and research energy will be directed toward issues of virus infections and other pathogenic issues. Pending an unexpected breakthrough in genetic procedures, bees and queens will be pretty much as they are today but the way information is delivered will be significantly different.

Bees In 1977, 1993, and 2025

1977: I could buy 3# packages bees for $18-$25. The options of 2#, 3#, 4#, and 5# packages were common. (*In the Spring of 2017, I will be paying about $120+ for a three-pound package.)* In 1977, the US Mail Service was the primary source of delivery. The Railroad Express Agency (REA) had been an option for delivering bees and equipment, but was waning in importance. (*Now packages are custom delivered by either the producer or by specialized beekeepers with equally specialized transportation equipment.)*

The Ohio State Beekeepers Association 1999 Fall meeting, Reynoldsburg, Ohio. Note the omnipresent Kodak slide projector in its' place of prominence. This event was a major source of information transfer. There were no digital cameras, no camera phones and no WiFi connections. Yet, these people loved bees just as beekeepers do today.

Many "races" of queen stocks were available. Caucasian and Carniolan queens could still be purchased from several producers. Midnight and Starline queens were popular and were high quality queens. American foulbrood was the frightful disease of the day, but antibiotics and sulfa drugs were seen as modern techniques for combating such diseases. A.I. Root, Dadant, and Kelley were the major equipment producers and were helpful in getting new beekeepers off the ground and supporting established beekeepers. The A.G. Woodman Company in Grand Rapids, Michigan manufactured quality smokers for many years. During the 70s, Dadant Company bought the Woodman Company. All in all, the '70s was one of the pre-mite beekeeping Golden Ages. I am happy I was there for the experience.

1993: Package bees were still readily available and reasonably affordable. In 1990, Africanized honey bees had colonized southern Texas. By 1993, the infamous bee would turn to the Western U.S. much to the temporary relief of Eastern

Will bee meetings look like this in 2025? (2015 Beekeeping Symposium, Clanton, AL)

Africanized honey bees attacking a beekeeper's glove in Venezuela. While this type of bee continues to be a menace, it is no longer considered to be a problem for most beekeepers. The reputation of these bees undersandably frightened people.

beekeepers. Some beekeepers and some states were still killing bees in order to save them. During the late 80s and early '90s, honey bees afflicted with tracheal mites or *Varroa* mites stood a good chance of being killed in order to control the spread of mites. As they are today, Africanized bees were normally killed as a way to protect society and the magaged honey bee population. To the honey bee population, this was much like *"removing bad blood from an ailing patient."* In and around 1993, there was much confusion about the best type of bee to have. It should be hygienic, but the science was not yet perfect to breed hygienic bees. By 1995, all U.S. states documented *Varroa* mite finds. During the 1990s, beekeepers loved their bees as much as the beekeepers of today, but mites and Africanized honey bees made it a tough love.

2025: Nine years from today, bees and their keepers will still be here. It's more difficult to get package bees. Shipping and handling packages is expensive and is highly specialized. However, in 2025, many beekeepers are making Autumn splits and others are wintering bees in special insulated nucleus hive boxes. The nutritional needs of these overwintered bees will be better understood. Trace elements and vitamin needs are now met. Improved bee genetics allows for the selection of "designer" queens. In 2025, bees still sting, but genetic techniques will soon be available to breed a nearly stingless honey bee. While beekeepers of the 70s didn't care for such sting-neutered bees, many modern beekeepers of 2025 will love them – as will their neighbors.

Bee management and pollination in 1977, 1993, and 2025

1977: Bee stocks were hardy and seemingly thrived even under the worst conditions. Many – if not most – new beekeepers took up bees because they found a swarm on their property. Pioneers of the day, like Brother Adam, were busy selecting for the perfect strain of honey bees. Bee breeders have been doing this selection process since the very beginnings of our bee industry. In 1977, chemicals were freely used but not as much as in the years immediately following World War II. Sodium sulfathiazole was still available from bee supply companies. In 1977, bee strains seemed strong and well adapted to their environment. American foulbrood was the biggest pathogenic fear. Commercial beekeepers and sideline beekeepers enjoyed significant numbers. It appeared that the industry was poised to grow. Though pollination was touted and honey bees were called, *"angels of agriculture,"* commercial bee pollination was still not a great income generator. Income from pollination usually subsidized honey prices. Otherwise, it was typical business. In fact, the beekeepers of today could readily work 1977 bee colonies. Don't expect to see plastic frames in 1977 hives.

1993: While the *Varroa*/tracheal mite issue was still hot in 1993, for many U.S. beekeepers the shock was beginning to wear off. Six years earlier (1987), Canada had closed its border to the importation of bees from the U.S. This was a staggering blow to U.S. package and queen producers – one that would take years for recovery. Some operations didn't recover.

Bee management was in an odd place in 1993. States without Africanized honey bees (AHB) wanted nothing to do with them. States that had them really didn't know what

Package bees being unloaded at the Cincinnati Post Office. This type of shipping has moved to specific drop points. Whether or not the U.S. Postal System will ever again be instrumental in distributing honey bee packages is unclear.

A polystyrene hive beside a traditional wooden hive.

to do with them. There was much talk about restricting incoming bees from AHB areas. This never formally happened, but beekeepers were frequently hostile toward other beekeepers who migrated from AHB areas. Making matters worse was *Varroa* and tracheal mite infestations. No one knew what to do with them either. Across the U.S., some bee colonies were strong and healthy while others harbored exotic pests or exotic genetics. Beekeeping was a patchwork of management schemes across the country. The Internet was playing an increasing role in information dispersal – with both correct and incorrect information. Oddly, it was an exciting time to be in beekeeping but not exactly a happy time for beekeeping. Pollination was frequently mentioned as a necessity to U.S. food production, but other battles had to be fought first.

2025: Improvements and advances in honey bee genetics and nutrition will have made bee stocks healthier and more productive. Pheromone and odor sensors will be important in telling the beekeeper what is happening inside the hive without having to open it. The chemical profile can be fed into a computer program that will show the characteristics of the hive. Aspects of this technology will also allow the queen to be more easily found and replaced. Indeed, most hives will have active connections to the Internet that will allow for remote monitoring. Happily, the Africanized Honey Bee issue is past.

Beehives will be made from composite (manufactured) wood/plastic products and will be better insulated against Winter cold and Summer heat. While bees – of all species – will still be important for pollination, increasingly, genetically modified plants will not require the high levels of pollinator populations of years past. New versions of artificial sweeteners will be developed and nutritionally enhanced foods will be readily available, but natural honey will still be coveted, as it becomes more of an antiquated oddity. The management schemes of commercial beekeepers will be significantly different from backyard beekeepers. The web will be the go-to source for most beekeeping instruction and information. Increasingly, bees and beehives will become virtual and remotely managed.

Obviously, I have been playing with this topic.

Obviously, I make no claim to being a visionary. Just as obviously, no one can tell anyone else what will be happening in 2025. But I am truly comfortable predicting this: Eight years from now, the bees will be pretty much as they are today, as they were in 1993, and as they were in 1977. Beekeepers and their gadgetry and understanding will be what will change. These have been some of the thoughts of Jim *"Nostradamus"* Tew. BC

Dr. James E. Tew, State Specialist, Beekeeping, The AL Cooperative Extension System, Auburn Univ; Emeritus Faculty, The OH State Univ. ***Tewbee2@gmail.com; http://www.onetew.com; One Tew Bee*** *RSS Feed (****www.onetew.com/feed/****);* ***http://www.facebook.com/tewbee2; @ onetewbee*** *Youtube:* ***www.youtube.com/user/onetewbee/videos***

Walking In The Footsteps Of Giants

Peter **Sieling**

Many years ago, my dad, the first beekeeper I ever knew, took me to the barn early one morning to milk the cows. We lived in the Lake Ontario Snow Belt and the snow was pretty deep for a four-year-old. Dad walked ahead of me. Looking back he saw me leaping from one of his footprints to the next, trying to match his stride and fit my little boot prints in his.

Fifty-five years later, I again attempted to follow the footsteps of giants. In 1890 and again in 1897, Ernest Root, editor of *Gleanings in Bee Culture* packed his Sunday clothes, stuffed a veil in his back pocket, and strapped a "Kodak" under his bicycle seat. He wanted to meet some of the New York beekeepers and discover the secret to their large honey yields. His journey, by train and bicycle took him zigzagging across New York State.

While reading through old issues of *Gleanings in Bee Culture*, I found a couple old photos of the Coggshall and Doolittle houses. What had happened in the last hundred years? Their houses may have fallen into ruin, burned to the ground, or been altered beyond recognition. I decided to try to find them.

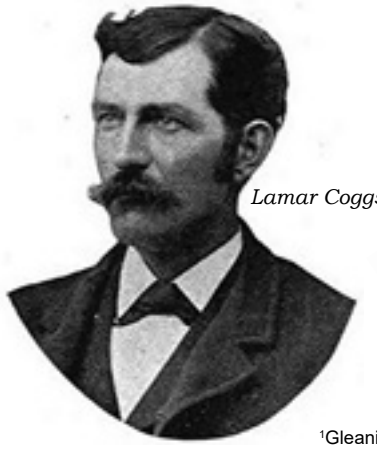
Armed with two photographs and descriptions of the neighborhood, my wife Nancy and I packed a lunch and set out to visit the former houses of the Coggshalls and G.M. Doolittle. Both lived in the eastern Finger Lakes region. We live at the southwest edge of the Finger Lakes. Our plan was to circumnavigate the Lake region and search for their homesteads.

In the gay nineties (that's 1890s for all you kids under 50), New York State was one of the largest honey producing regions in the United States. Several of the largest and most progressive honey producers lived in the Finger Lakes region and east. It was buckwheat country. In 1897, Ernest Root exclaimed, ". . . New York State has more beekeepers to the square mile (I was about to say to the square inch) than any other place on the globe. I have been in locations where from one hilltop could be seen as many as 5,000 acres of buckwheat fields – counties where there were all the way from 2,000 to 3000 colonies!"[1]

There is still a lot of beekeeping and a rich history in the Finger Lakes. Between Keuka and Seneca Lakes, we detoured north to a Mennonite bulk food store. Their shelves were stocked with Wixon honey, a multigenerational honey and beekeeping supply company. My dad bought his supplies there in the 70s and I buy supplies there now. We drove southeast across the plateau and down through Watkins Glen, familiar to race car fans. Watkins Glen sits at the southern tip of Seneca Lake, the deepest of the Finger Lakes. It never freezes over and I have been told that people come from miles around to fill their car radiators with Seneca Lake water to avoid the expense of buying antifreeze. If you believe that, I have a new patent hive I'll sell you.

Rounding the end of Seneca and driving up hill away from the lake feels almost like taking off in an airplane. The next lake is Cayuga and as we descended out of the

One of the outyards of David Coggshall.



Lamar Coggshall

[1]Gleanings in Bee Culture. 1897 page 672.

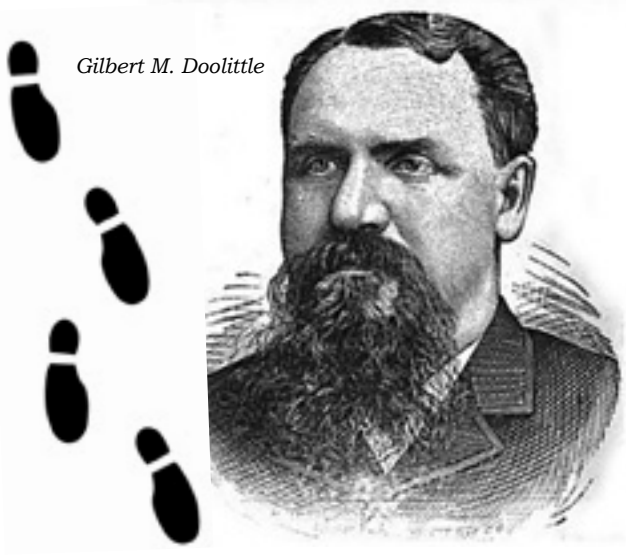
Residence of David Coggshall, West Groton, NY, 1897.

David Coggshall's house, 2016.

clouds (figuratively speaking) we saw Cornell University across the valley reflecting the sun like a "shining city on a hill", its huge buildings looking down on the city of Ithaca in the valley.

Colleges and universities in New York are frequently built on hillsides. Why waste good farmland? At Cornell, a *Bee Culture* columnist, Dr. Roger Morse, taught a generation of bee researchers, professors, and full time beekeepers. I never met him, but as a young beekeeper I once wrote him a letter and I have his reply still tucked in one of his books – *A Year in the Beeyard*. I took beekeeping classes at Cornell under Dennis vanEngelsdorp, now at the University of Maryland. There was some talk of dropping the beekeeping program a few years ago, but funding has been restored and they are now developing a new beekeeping program. After rounding the tip of Cayuga Lake, we saw the County Cooperative Extension Building, the meeting place of the Finger Lakes Bee Club. They've asked me to lecture there twice, proving that either I'm not a horrible speaker or they couldn't find someone else to talk.

We stopped at a visitor's center, tucked away off the main highway, picked up some tourist brochures, ate lunch, and consulted the map. Was it Fate or Providence?



Gilbert M. Doolittle

The visitor center was on the road we needed to take. If we had flown past, we could have ended up in Cortland. Once more we ascended into the hills. We were aiming for West Groton, home of the Coggshall brothers, David and Lamar. By 1897, Lamar owned between 1,100 and 1,200 colonies in ten bee yards spread out over 40 miles. David had 600 colonies and with all his extra free time, did regular farming and poultry.

Ernest Root missed the Coggshalls on his first visit, but seven years later it was one of his main stops. Ernest said the Coggshall's harvesting methods would "make a beekeeper's hair stand on end". They would typically harvest 3,000 to 5,000 lbs of honey in a day with nothing but a three or four man crew removing one comb at a time, uncapping with a single cold knife, and spinning them in a four frame extractor. Ernest called it the "lightning-kick-slap-bang-get there plan."

If you want to try it yourself[2], start with a sting-proof suit. The first man kicks off the cover, sending it flying to the ground. They used enameled cloth instead of inner covers. Pull it up on three sides, leaving the fourth edge stuck down like a hinge. Puff a cloud of smoke under the cloth and push the smoke down through the frames using the cloth like a bellows. That clears most of the bees from the super. I tried it and it works. Remove the frames one at a time, shake the comb, give it two swipes with a bee brush and shove it into an empty super on a wheelbarrow. Once the super is empty, kick it off with your foot. That knocks off the remaining bees. Now place that super on the wheelbarrow and fill it from the next super. The second man wheels four supers into the extracting building, a bolt together shack. A cloud of robber bees fills the room. Bees by the thousands fall into the extractor and drown. The third man uncaps the combs, and the fourth spins and draws off the honey until he reaches the layer of drowning bees. By the end of the day, there will be a three or four inch layer of dead bees floating in the extractor. They are dumped and the robbers carry the honey back to their hives to be harvested later or used for Winter food.

[2]I am not endorsing the Coggshall method. It was fast, efficient, and they made a lot of money, but it was rough on the bees. It is better to be a little slower and a lot more humane.

Doolittle and his favorite five-banded bees, 1897.

The apiary of G.M. Doolittle, Borodino, NY, 1890.

When Ernest visited he could hardly believe the cloud of stinging bees, but one of the boys later confessed that they *might* have stirred the bees up a bit for his benefit.

One of several articles on the Coggshalls in the 1890s shows a photo of the distinctive Eastlake style "house that bees built". I wondered if we could find it. All we knew was the location was somewhere near West Groton. We had our car's navigation system, a GPS, and a cell phone GPS all running at once, plus a map. Without a house number or road name, the modern devices were nothing but dashboard ornaments. We had to depend on the map, but West Groton was located in a crease.

After wandering up and down dirt roads, we managed to find Peruville, then Groton. I got local directions at the gas station. Five miles later we found West Groton Rd. and then an intersection, half a dozen houses, and a church. We drove two miles out of town, back tracked, two miles down the second road, and then tried the third road. There is was! It was like seeing the Emerald City for the first time. It has been kept up in beautiful condition. The current owners sell organic beef, eggs, and dairy in a store on site, so I didn't feel too shy about stopping and knocking on the door.

Ed Scheffler, the owner came out. He knew the house used to belong to the Coggshalls and that they kept bees after someone invented a new hive. The only vestige of their honey business was in the attic – a cardboard comb honey box. He graciously allowed me to take some photos.

David and Lamar were active in beekeeping organizations, but they didn't have time to write. Lucky for us, Lamar had a protégé, Harry Howe, one of his "lightning operators". Off season, Harry built and sold bicycles, taught school, and managed a couple of his own apiaries near Cornell. He wrote several entertaining stories about the Coggshalls in the late 1890s. After studying entomology at Cornell, Harry moved to Cuba to become a full time beekeeper.

After the Coggshall's we continued east toward the home of one of the greatest beekeepers who ever lived, G.M. Doolittle – the father of modern queen-rearing, and a prolific writer. We were following in the footsteps of beekeeping pilgrims from all over the United States. Doolittle had a lot of visitors.

We did not see Owasco Lake. Moravia, the village on the southern end is situated farther south because of the marsh flats. The village of New Hope, my childhood hometown, sits halfway between Owasco and Skaneateles Lakes at the top of the hill. There's my old house, the church, and the store. The mills are boarded up. G.M. Doolittle and I were practically neighbors, separated by seven miles, forty years, and a lake.

Doolittle's life spanned 72 years, from 1846-1918. He gets a short paragraph in the *ABC and XYZ of Bee Culture*. There is much more, but you can only piece together fragments of his biography from his writings. As a boy Gilbert performed poorly in school. He showed a deep interest in honey bees from early childhood. His father, a farmer and part-time beekeeper with 20-40 colonies, prayed that Gilbert would fail at beekeeping and become a farmer. Gilbert persisted and became one of the most successful beekeepers, queen producers, and beekeeping teachers of his generation.

While the Coggshalls managed over a thousand colonies, Doolittle probably had fewer than 100, one home yard and one 30 colony out-apiary. He produced mostly section honey, what we would call comb honey. Doolittle practiced intensive management rather than relying on large numbers of colonies. In a poor year he would get yields of over one hundred pounds per colony and regularly harvested 200-300 pounds per colony.

Besides section honey, his specialty was queen rearing. Doolittle shipped queens all over the world. His techniques, described in *Scientific Queen-Rearing*, are still used today with only minor variations.

Doolittle house, 2016.

Final resting.

As an author, Doolittle wrote three books, and for almost 50 years wrote regular columns for seven beekeeping periodicals. He was a popular speaker at conventions. A devout Christian, he sprinkled his talks with scripture quotations and kept his listeners in stitches with his anecdotes.

I have learned much through reading his column, *Conversations with Doolittle*, written at the turn of the 20th century. For example, a bee in April is worth 100 in June. That's because that bee nurses the larvae that nurse the larvae that will gather the honey during the big nectar flow.

A colony rich in stores produces more bees than a colony near starvation. A frame of uncapped honey inserted in the middle of the brood nest will stimulate the bees to move the honey above and the queen will fill the newly empty frame with eggs.

The brood nest should be wall to wall brood 45 days before the honey flow to have the maximum number of foragers when most needed.

Finally, something to "paste in your hat". As you are leaving the apiary, turn around and look over your apiary to make sure everything is in "apple pie order". How often I have left something behind and had to go back.

When R.B. Leahy, the Editor of *The Progressive Beekeeper*, traveled from Missouri, he mentioned meeting Doolittle's pet squirrels, Daisy, Fawn, and Gladstone, who came out of the trees to eat breakfast on Doolittle's lap. Ernest Root, seeing a telescope in Doolittle's workshop, noted that Doolittle was also an amateur astronomer. To visit Doolittle, editor R.B. Leahy took a train to Skaneateles village, boarded a steamer south to the Borodino Landing, then hiked up the hill to town and hitched a ride with Doolittle's wife at the post office. Ernest rode his bicycle southwest from Syracuse, coasting down Rose Hill Rd. until suddenly the Doolittle house appeared on the left. That's what we had for directions.

View from Doolittle's grave.

Nancy and I turned north on Rte. 41 at Scott, approaching Borodino from the south. Fifteen minutes later we stopped at the Borodino cemetery on the south end of the village. It is located on a steep hillside. Old and new tombstones leaned higgledy-piggledy along the narrow winding path made for horse-drawn hearses. Squeezing a car between tombstones felt like we were driving over toes of those resting in their graves. It was a perfect cemetery to wander through, on a windy night, clouds scudding under a gibbous moon.

We wandered among the tombs and after a few minutes of searching, Nancy found the monument of Gilbert M. Doolittle and his wife Frances. There were no other Doolittles in the Cemetery, as though he appeared out of nowhere and vanished into the mists of history. Doolittle died of "heat prostration complicated by contracting a severe cold". He would surely have a different diagnosis today and would have lived many more years. "The voice of a great beekeeper-teacher has been stilled."[3]

The epitaph on his stone is a stanza from John Greenleaf Whittier's *The Eternal Goodness*:

I know not where his islands lift
Their fronded palms in air.
I only know I cannot drift
Beyond His love and care.

Borodino, consists of an intersection, a few houses, a church, and a store. We turned east on Rose Hill Rd. A couple miles out we saw a square, hip roofed house but no widow walk, with the right porch, and several outbuildings. I knocked at the door. It was closed up and

[3]Doolittle's obituary. Gleanings in Bee Culture. 1918. p.397

silent as though no one lived there. We drove back to town, then down to the landing on the lake. Stopping at the store, an elderly woman was selling baked goods outside the front door. I asked if she ever heard of Doolittle. She referred me to the store owner who referred me to the town historian. No one that I asked had heard of Borodino's most famous and revered citizen. A prophet is not without honor except in his home town.

With the sun setting we drove north to Skaneateles and west through the villages and cities at the heads of the Finger Lakes: Auburn, home of Harriet Tubman, Seneca Falls, the town on which *It's a Wonderful Life* was modeled, and Geneva, where both in the 1890s and today you could attend the Geneva Bee Conference.

South of Geneva, we passed through Bellona, a dip in the road with a church and firehouse, once famous as the home of the Ontario Beekeepers Club, not to be confused with the current Ontario Finger Lakes Beekeepers. The Ontario Beekeepers spent most of the 1890s sending out letters and petitions to have *Apis dorsata*, the giant Asian honey bee introduced to the United States by the Federal Government. There was a big controversy over whether that was a good idea or not. A.I. Root, Ernest's father, received several queens preserved in alcohol, and a beekeeper/missionary was on the lookout for colonies to put in a hive and ship halfway around the world. Some people speculated that these bees might not consent to being kept in boxes.

Did the Bellona beekeepers ever get their Asian honey bees? Did Doolittle ever convert from Gallup to Langstroth hives? Did Harry Howe make a success of beekeeping in Cuba? The answers may or may not be found. The internet contains the Big Book of Beekeeping History and there are a lot of pages, enough for a lifetime of reading. BC

Peter Sieling lives in the Finger Lakes region of New York, is an expert wood craftsman, and a frequent contributor to these pages.

PERMACULTURE

Can It Save The Bees, And The Beekeeper?

Darlene **Bentley**

A little over two years ago we settled with our bees into a valley home near the northern end of a protected, undeveloped lake, part of thousands of acres of land owned by the people of New York State. The natural area surrounding us supports an abundance of animal life and a diversity of native and introduced plant species. Many of these plants are beneficial to pollinators. These include joe-pye-weed, boneset, bird's foot trefoil, chicory, skunk cabbage, mints, thistle, Queen Anne's lace, yarrow, sumac, Japanese knotweed, and poison ivy, as well as woody trees and shrubs like hawthorn, serviceberry, ninebark, locust, black cherry, black walnut, basswood, maples and willows. Our small property – just under six acres – reflects the habitat diversity of the surrounding ecosystems. It contains a variety of microenvironments: wetlands, former fields in various stages of succession, mixed deciduous woodlands and small stands of mature spruce and Scots pines.

My experience with bees, gardening and native plants, and my beekeeping and life partner's woodworking skills, computer expertise and patience with machines (and me), provides a solid skill base for what we hope to accomplish. Our goal is to develop and implement a land management plan that centers on our bees and our acquired acreage. Since the bees are a crucial component, as pollinators for a variety of crops, and as producers of honey, propolis and wax, our earliest tasks focused on setting the colonies into their new home: clearing an area for the apiary, establishing the footprint for a bee yard storage shed, and planning for an extraction and bottling area. By the end of our first year, we had also planted an abundance of edible and ornamental perennials, fruit and nut trees and bushes, and an extensive vegetable garden in a fenced acre clearing.

As we moved forward with our plans and refined our goals, the need for careful land management became increasingly evident. We wanted to grow a wide variety of edible and medicinal plants for personal use, while supplementing our incomes by selling surplus crops and value added products – helping to meet the growing demand for goods produced and distributed locally. We opted for a permaculture approach for land use, which would allow us to preserve existing pollen and nectar sources while providing opportunities for integrated edible and ornamental pollinator-beneficial plantings. It also fit well with our desire to protect and work harmoniously with pre-existing microenvironments, including the evergreen groves – half of the available land – and an established bog area.

In contrast to traditional farming methods, permaculture gardening preserves and manages natural habitats. Plants are strategically integrated into the existing environment based on their growing needs, and new planting areas are intentionally planned to mimic natural ecosystems – creating species rich environments where plants, animals and decomposers assume crucial niches in an integrated forest-like environment. Trees provide shade and forest litter to low growing plants, which suppress weeds, deter pests and provide beneficial nutrients to build the soil. Once established, these forest gardens function as self-contained polycultures, requiring less maintenance than traditional monoculture plantings. The diversity of species in forest gardens creates an ecological balance that, under ideal circumstances, fosters healthy, disease-free plants, attracts and supports beneficial insects, and maintains habitat for predatory animals. This is part of an Integrated Pest Management (IPM) based approach that also includes more direct interventions, including hand picking of pests and the use, if needed, of organic pesticides as viable alternatives to synthetic pesticides – which can contaminate food supplies and kill beneficial insects, including honey bees.

Preserving existing woodlands provides aesthetic as well as ecological benefits. When we first saw the property, we were attracted to the beauty of the Norway spruce groves; we dreaded removing any of these trees. Originally part of a Christmas tree farm, many of the spruce now stand eighty to ninety feet tall, creating a densely shaded area of understory that supports ferns, fungi, moss,

clusters of Jack in the pulpit and ground dwelling amphibians, such as the yellow-spotted salamander and red-spotted newt. The high canopy supports owls, pileated woodpeckers, flickers, migratory songbirds, red-tailed hawks, tree frogs, bats and, unfortunately, squirrels. One of our first challenges was to balance the preservation of these unique microenvironments, and the species dependent upon them, with our need for sunlight – both for sun-loving plants and for the bees.

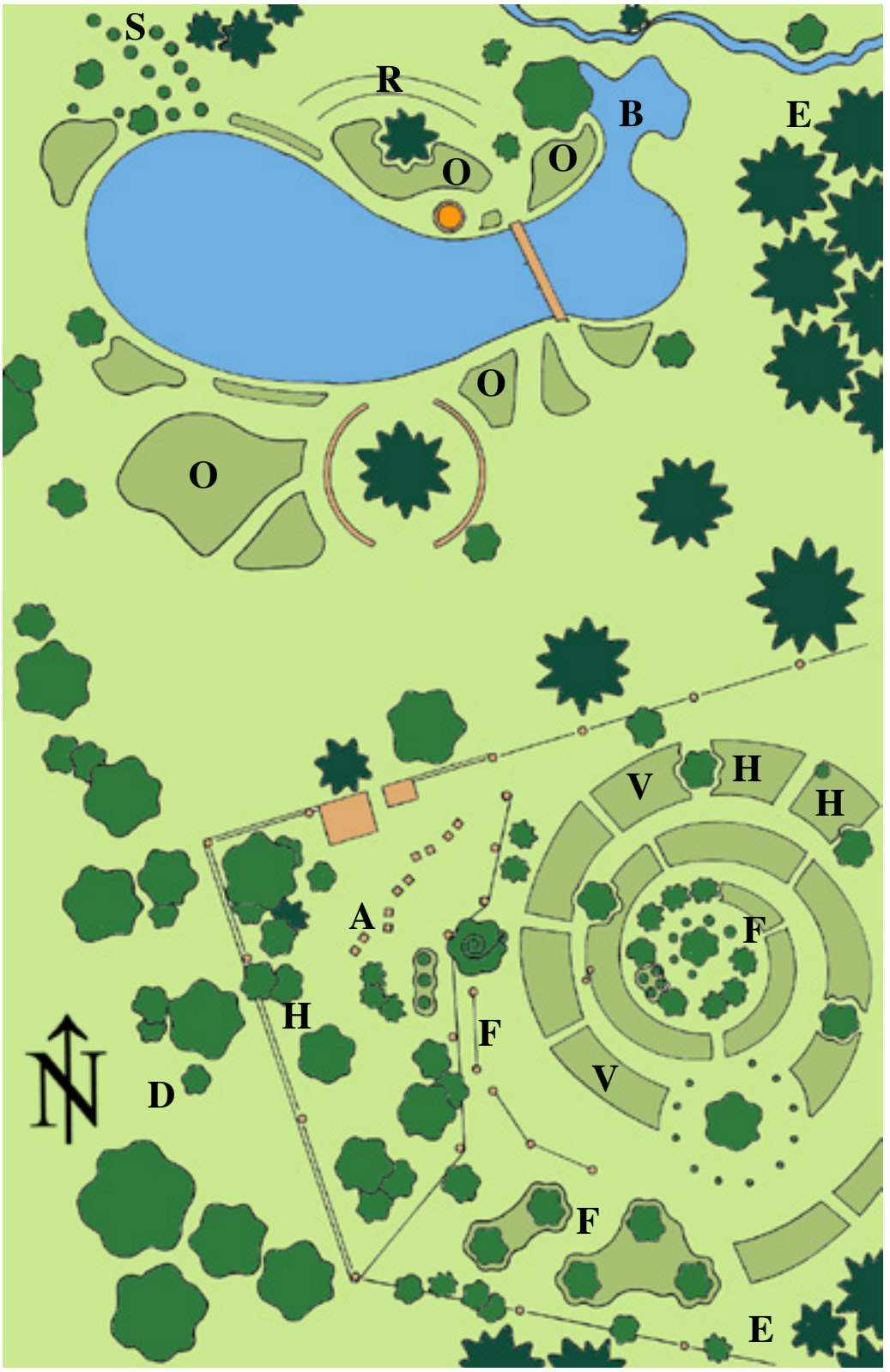
Torrential rains and flooding conditions that hit our area two days after we purchased the land provided us some direction. When water from a small stream along the edge of the property changed course, it flooded the northern spruce grove and left several large spruce in the adjacent clearing standing in two feet of water. We removed the cluster of trees in this open area, and also cleared several wonderful trees that divided this area and the other open area to the south – the only area that receives six or more hours of sunlight daily. We removed a few additional trees that were crowding healthier spruce or were encroaching on the small number of mature black cherry and black walnut trees at the edges of the evergreen stands. Our initial hesitation to remove any of these majestic individuals was mediated by the natural changes resulting from the storm, planned supplemental plantings, the benefits of thinning around deciduous trees and our plans to use this harvested wood on the property. We had also discussed building a pond for habitat and irrigation; we now had a pond location.

Even with the removal of the spruce trees, the property is still dominantly shade or partial sun. We set the apiary up along the edge of our deciduous woods, which gets the morning sun (once the sun rises above the spruce stand) and remains sunny until early evening. To make the best possible use of the remaining portion of this largest clearing (less than an acre), we established a garden directly in front of the colonies. This places a variety of crops that need pollination within close proximity to our bees. It also puts us right in the bees' flight paths while working in the garden. To mediate this, our earliest permanent plantings included currents, raspberries and paw paws, placed between the planting beds and the apiary to alter the bees' flight paths. This year, we also set in a row of grapes to complete this boundary.

In keeping with the permaculture approach, the clearing is now planted with small fruit and nut trees, with an understory of bushes and raised perennial and annual vegetable beds and herbal ground covers. Efficient integration of plantings includes both vertical plantings and ground covers. A tall ash tree serves as a pole for five varieties of hops plants, and a large black cherry serves as a support for hardy kiwi. The barrier fence that protects the garden from deer (with the help of the dogs) provides support for grapes, currents and mulberries. Ever bearing strawberries find a niche beneath dwarf cherry trees. Dense mats of five different thymes have been established under the blueberry bushes, suppressing weeds and serving as a deterrent for insect pests. Lavender serves a similar function under the hazelnuts and filberts. Other aromatic herbs, which also serve as deterrents to insect pests, are interspersed among the rotating vegetable planting beds. Annual beds and areas where low growing vegetation is not well established are mulched with wood shavings from treetops, brush, and pruned branches harvested on site. These mulches mimic forest litter layers, providing habitat for earthworms and other forest decomposers, conserving moisture and insulating plant roots. As fruit trees and bushes mature, and low growing perennials become established, this half-acre area will produce a wide range of fruits and vegetables, as well as many culinary and medicinal herbs.

Ecological restoration of existing habitats is beneficial to native species and can provide additional opportunities for integrated plantings. The deciduous forest adjacent to the apiary - predominantly ash interspersed with black locust, black cherry and hawthorns – had become overgrown with Japanese Honeysuckle, multi-flora roses and garlic mustard. Removal of these invasive plants benefited the existing lady ferns and Jack in the pulpits. It also exposed fertile mounds of substrate – formed by decomposed logs overlaid with accumulated deciduous leaves and decomposing herbaceous plant material. This exposed soil understory provided an ideal habitat for culinary and medicinal herbs that prefer or are tolerant of the partial shade and moist woodland soils. We planted these fertile mounds with Goldenseal, Black and Blue Cohosh and Ginseng, marketable native herbs. Closer to the bees, we planted European and American Elderberry (for food and bee forage), and we interspersed the existing ash grove with Carpathian walnut and butternut trees. Given the likelihood of the ash trees succumbing to emerald ash borer (EAB), these newer plantings of trees and shrubs will form a replacement forest canopy to shelter shade-loving natives (including the newly established medicinal herbs) and provide plant litter for protective mulch and nutrient enrichment. The removal of the invasive species and selective replanting diversified the existing microculture, allowing existing native ornamental species to thrive, while providing additional space for select plantings of edible and medicinal plants.

The alignment of plant needs with existing environmental conditions is key to establishing native or introduced beneficial plants to a new area. Carefully planned introduction of edible crops in all available microenvironments maximizes potential harvests, while protecting existing



A – Apiary
B – Bog
D – Deciduous Forest
E – Evergreen Forest
F – Fruit
H - Herbs
O – Ornamentals
R – Rosa rugosa
S – Sea buckthorn
V – Vegetables

habitats and pollinator forage. As we continue to clear invasive plants from other areas of the property, we are exploring additional planned plantings that compliment products from the hives, increasing our ability to establish a nutrapharmaceutical niche market centered on the bees. A larger, mostly shaded area has been interspersed with serviceberries, buttonbush, spicebush, high bush cranberries, viburnum and pussy willows to supplement existing native bushes. Edible cranberries will be introduced in a small sunny bog clearing that currently supports forget-me-nots, skunk cabbage and marsh marigold - which can remain as beneficial ground cover encircling the cranberry plantings. The vernal pools that form water "pathways" through the cranberry plantings will continue to provide habitats for reptile and amphibian populations - which help to keep insect and rodent populations in check. At this point in human environmental history, when so many invasive species have been introduced – accidentally or intentionally - into ecosystems that have been repeatedly altered by human intervention, planned land management can help some of these sensitive areas adapt to change, while still providing potential growing areas for suitable crops.

Some of our restorative interventions are more intensive, altering the existing landscape and creating new habitats. Our pond is one example; it replaces a lawn area– a labor-intensive ornamental monoculture. The pond basin will capture water that flows off the hills to the east – significant during major rain events – with the overflow feeding back into the wetland areas below. The pond basin is divided into two sections - approximately three quarters of an acre total area. At eighteen feet, the larger pond area is deep enough to support a small population of large mouth bass and bluegills for food. Water plants, established on ledges in the pond's dike, will provide protection for minnows and bass eggs. Native crayfish – which bass eat - are already moving into the waterfall areas, where rocks are interspersed with naturalizing plants to minimize erosion. Once the pond is fully saturated and filled, cool water from the deep end will be pumped into a constructed wetland area adjacent to the upper pond, which will serve as a settling pool and natural filter. Bog plants established in this area will include edible ostrich ferns – valued for their gourmet fiddleheads. A sunny, sloped area near the lower pond has been planted with sea buckthorn – another plant with nutrapharmaceutical potential, and a Rosa rugosa patch on an earth berm will provide rosehips for tea – to pair with honey, of course. Water will be pumped from the pond for irrigation, including frost protection for the cranberries. What was once a large area of grass is evolving into a series of microhabitats that will support a wide assortment of introduced and native plants and animals.

We are also landscaping areas around the pond with cut flower ornamentals, which will provide supplemental income to complement honey sales, while providing additional sources for pollinator forage. Many of the newer, showier hybrid cut flower varieties have the pollen, nectar or fragrance systematically bred out of them and are not beneficial to honey bees. There is an abundance of ornamental varieties that pollinators love. In choosing ornamental varieties, we are balancing perennial beds of popular cut flowers with nectar and pollen plants that supplement our bees' wild forage. We had already planned for some "cultivated" pollinator friendly native wildflower areas in woodland borders, many of which can be used as cut flowers. We also chose varieties of ornamental alliums, asters, yarrow, milkweed, sunflowers, and mints - that have multiple smaller flower clusters favored by honey bees and other pollinators. Planting concentrated areas of select varieties that bloom at varying times provides additional forage near the colonies to help bees span periods of dearth. This includes an abundance of woody ornamentals that thrive in wet and semi-shady environments and are favored as cut flowers and as pollen and nectar sources.

Supporting existing native species and diversifying plantings beneficial to bees is just one aspect of our sustainable use of the land. We are also managing our small stands of conifers and hardwoods. My partner's skill in woodworking, which I am gradually acquiring, provides avenues for creative presentation of products and for reducing woodenware costs. He has already designed and fabricated double-screened boards for overwintering the bees and a wooden honey bee bookmark. We used some of the spruce for a sugar feeding station we designed and built – using up-cycled plastic nut containers to hold

the syrup - and in the construction of our bee-equipment shed (the shed's windows and doors are salvaged and are framed with leftover oak barn boards we found on the property when we moved in). Our mature ash will provide additional lumber resources as these trees succumb to EAB. Other mature trees will be selectively harvested due to declining health or competition, part of an inevitable evolution in our changing natural environment.

The bees remain central to our life and our future goals; their care is paramount to our success. We plan to make additional splits from our survivor stock and graft queens summer 2017 to expand our apiary, slightly (we recently took the Penn State Queen Rearing Course to learn more about this and get some hands on experience). Making splits will be part of our apiary management plan. In additional to providing increase colonies and replacements for winter losses, it also breaks the brood cycle, limiting the potential for *Varroa destructor* to reach threshold levels in the colonies. Combining this with drone frame mite traps reduces mite counts, allowing colonies to remain disease free. With these strategies and careful selection of hygienic bees from survivor stock, we may be able to avoid treating colonies for mites. We have also planted European pennyroyal – a creeping mint with pest deterrent qualities – below the hives to deter weeds. The essential oils derived from these plants are used in some organic mite treatments, and gathering their pollen may help bees combat mites. Maintaining smaller colonies likely reduces honey yields, but allows us to create a local niche market for untreated honey, propolis, candles, and value added herbal products.

Sharing borders with undeveloped state lands provides protection from synthetic pesticides and other harmful consequences of increased human migration into rural areas and offers bees a greater diversity of forage. There are also inherent disadvantages, including mammal pests that can present challenges in small garden landscapes. Careful planning is needed to find a balance between our goals and the needs and protection of our small acreage and its many inhabitants. We are open to seeing how we will evolve as we settle onto the land and grow our business, along with our apiary. As forage areas decrease, and the challenges associated with keeping bees increase, we need to explore new, and old,

ways of preserving the habitants that benefit our bees. A permaculture approach to land management maintains diverse foraging areas that support honey bees and other pollinators, while increasing the potential yield for specialty crops on smaller land areas. Moving away from large apiaries and fostering a network of smaller beekeepers, as part of the expanding locally produced food and craft market, is one way for beekeepers, and the bees, to adapt and survive. BC

FOUND IN TRANSLATION

What's Going On At The Beltsville Bee Lab?

Jay **Evans**

Practical research discoveries follow a twisting path. Basic research driven by the human need to understand nature can, often years or even decades later, lead to huge advances that benefit people or the environment. Alternatively, sure-thing tests of a new product, management strategy, or breeding scheme often fail at the last moment when applied to 'real' life. In the column **'Found in Translation',** I want to describe success stories in translational bee research, projects where the toil of scientists has led to 'news you can use' as a beekeeper. These stories will come from university, government, or industry scientists in the worldwide bee research community who have made an important and practical discovery, or who have put pieces together from others' research to make a substantial advance for the bee industry. While I promise not to over-rate home team advances by USDA, this first month I have the honor of introducing the scientists at the USDA Agricultural Research Service Bee Research Lab in Beltsville, MD and describing how they are working to address issues facing bees. Next month will begin explorations of impactful research from around the bee world.

USDA scientists have conducted bee research near Washington DC for over 100 years, and at the Beltsville Agricultural Research Center since the 1930s. Currently, the BRL is comprised of nine full-time federal employees and a team of 20+ students and collaborators from the U.S., England, Thailand, Spain, and China. The mission of the BRL is to provide innovative tools and insights for building and maintaining healthy honey bee populations. Research is focused on interactions between parasites, chemical stress and nutrition and on the defenses mounted by bees and beekeepers toward these threats. The BRL also runs the longstanding Bee Disease Diagnostic service (currently headed by Mr. Samuel Abban), an effort that both drives our disease research and benefits beekeepers. Below are brief summaries of four main research directions at the BRL.

Dr. Judy Chen studies honey bee disease processes and interactions between honey bee workers and their major pathogens and parasites. Her main focus is on viruses and nosema. Her work has defined the roles of *Varroa* mites in vectoring virus infections and clarified how viruses are transmitted among bees and colonies. She is also determining how nosema affects bee health and how specific honey bee proteins can be used to fight this disease. Judy hopes that her next translational product will be novel agents and therapeutic strategies for bee disease diagnosis and treatment.

Dr. Steven Cook carries out field and lab experiments aimed at identifying the impacts of chemical, disease and environmental stress on bees and making bees more resilient in the face of these threats to their health. Aligned with these aims, Steve's next translational product will consist of a dietary supplement that will reduce the stress honey bee colonies experience overwinter, and make them stronger and poised for explosive growth in Spring. He has also built a research team focused on *Varroa* mite development and physiology, and designing novel controls for this major honey bee pest.

Dr. Miguel Corona conducts research on honey bee nutrition and queen health. He is especially interested in improved protein and lipid nutrition, identifying deficiencies that cause worker bees to mature too quickly to the forager stage, thereby becoming short-lived and more susceptible to disease. Miguel's mantra is 'fly soon die soon'. Miguel also looks for ways to improve and extend queen longevity and fertility, adding to work by former BRL scientist Dr. Jeff Pettis. He has found that subtle changes in nutrition during larval development have an important impact on queen fertility. His leading beekeeper-ready candidate is a nutritional supplement that restores pollen deficiencies to ensure normal bee behavioral development of the bee and enable them to defeat diseases and harmful chemicals.

Jay Evans is Research Leader for the group. His research is focused on the genetics and control of honey bee disease. He has developed genetic resources for each of the major bee disease threats and has carried out research showing the effectiveness of bee immunity and management tools for reducing disease levels and bee stress. He hopes in the next year to push forward projects using natural compounds for reducing bee disease impacts, while continuing collaborative work on the genomes of bees, mites, and hive beetles.

All four of the BRL scientists work together and with talented worldwide colleagues to determine interactions between pesticides, nutrition and disease and to look for ways to improve bee health in the face of these threats. As with all applied bee researchers, they want to decrease impacts these threats have had on bees, beekeepers, pollination, and the environment. More information is available at **www.ars.usda.gov/northeast-area/beltsville-md/beltsville-agricultural-research-center/bee-research-laboratory/**. BC

BIGGER PICTURE

Jessica **Louque**

Spring Seeds Part 1 – Johnny's Selected Seeds

I'd say most of the readers for *Bee Culture* would consider themselves at least a hobby gardener. Bees and gardening rarely stray from each other. In this, we all share that same crossover from Winter boredom into seed catalog madness, earmarking the new varieties we want to try out and deciding whether to be "reasonable" this year or pretend to ignore the *actual* amount of growing capacity available. These are always some of the most colorful catalogs, displaying the rich offerings that you too can have if only you buy the seeds and take care of them. I promised myself that I wouldn't go overboard this year like last year, and the year before, and the year before that, so I've only ordered a few hundred dollars' worth of seeds so far (ha). I have favorite places to buy my seeds, based on what I want, so I've done a mini interview with some of them to share their offerings for their products. The first company up is Johnny's Selected Seeds.

Johnny's has been a staple in the garden as long as I've lived in my current house. They have excellent customer service, a large selection of seeds, and a fairly high germination rate. We started using them at work with our bees because they have a lot of organic heirloom varieties that we can buy in bulk without worrying what our bees might pick up from it. Last year, we bought enough pumpkin seed for 500 acres, and may have bought all of the Wee-B-Little variety available in the U.S. This year, we bought enough buckwheat for around 150 acres as our "large" purchase. They are quick to deliver and help us choose what works best in the area we need to work in, giving the positives and negatives for each variety.

The company itself has turned from a sole ownership endeavor into a 100% employee owned operation. The main office is in Winslow, Maine, with administrative offices and the call center in Fairfield, Maine, and a 40-acre research farm in Albion, Maine. The company tries out all of the varieties that are sold to the public to check for things like germination rate, disease resistance, frost resistance, drought resistance, or quality in general. Johnny's also sells a lot of useful farm tools that are also implemented on the research farm to make sure they sell quality products. Johnny's is also certified organic by the Maine Organic Farmers and Gardeners Association (MOFGA), and has been since 1979. All of the breeding is done the old fashioned way without genetic engineering. Even though it's a slow process, Johnny's has produced a lot of new varieties including my favorite 'Bright Lights' Swiss chard and the 'Carmen' sweet pepper – both of which are All-America Selectors (AAS) Winners.

Each year in the Fall, the staff at the research farm has to make the evaluations of the new varieties to see what makes the list for the next year's catalog. One of the main goals of Johnny's is season extension, giving them an even longer Fall for hoop houses and row covers. The result of these trials leads to some new exciting additions for 2017. I asked Johnny's for a list of their favorite additions, and I know some of you will be ready to give these a go in your own gardens.

For the Johnny's list, I specifically requested the staff picks for the new varieties. There are some things that are chosen just because a variety might be a little more cold tolerant, or have disease resistance, or something slightly less interesting, but the staff picks would have a little more flair or interest (in my opinion, anyway). I didn't just want to have bee-friendly flowers, or just honey bee-pollinated crops. I think they did a nice job giving me a little bit of everything. After all, a well-rounded gardener has a whole lot of everything. Here's the list of Johnny's favorite upcoming selections:

Baron

Baron is a highly-adaptable, large-fruited Ancho, or Poblano, pepper. It has proven to produce better than other Anchos under challenging conditions. The fruits are very large (average size is 5" X 3") and are typically two-lobed which makes them easy to stuff and cook in their signature dish, chile rellenos.

Just in case you're interested, here's a little nudge towards trying out Baron peppers

Chile Rellenos Recipe
6 fresh Ancho peppers
1 (8 ounce) package queso asadero (white Mexican cheese), cut into 3/4-inch thick strips
2 eggs, separated
1 teaspoon baking powder
3/4 cup all-purpose flour

Preheat the oven's broiler and set the oven rack at about six inches from the heat source. Line a baking sheet with aluminum foil. Place peppers onto the prepared baking sheet, and cook under the preheated broiler until the skin of the peppers has blackened and blistered, about 10 minutes. Turn the peppers often to

blacken all sides. Place the blackened peppers into a bowl, and tightly seal with plastic wrap. Allow the peppers to steam as they cool, about 15 minutes.

Rinse cooled peppers under cold water to peel off the skins, and cut a slit along the long side of each pepper to remove the seeds and core. Rinse the peppers inside and out, and pat dry with paper towels. Stuff the peppers with strips of the cheese.

Whisk the egg yolks in a bowl with the baking powder. In a second metal bowl, beat the egg whites with an electric mixer until the whites form stiff peaks. Gently fold the beaten egg whites into the yolk mixture. Place flour into a shallow bowl.

Heat the vegetable shortening in a skillet over medium heat. Roll each stuffed pepper in flour, tap off excess flour, and dip the peppers into the egg mixture to coat both sides. Gently lay the coated peppers into the hot shortening. Fry peppers until lightly golden brown and the cheese has melted, about five minutes per side.

Blaze

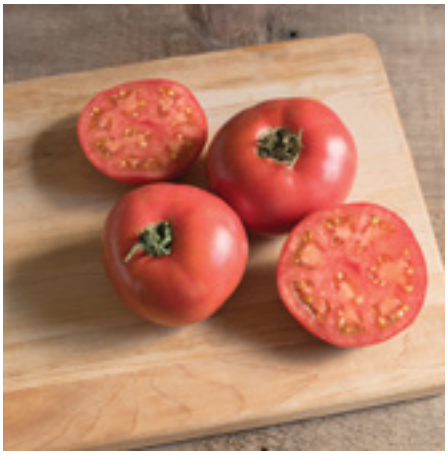
Blaze is a uniform, colorful, and high yielding pumpkin. Flashy fruits are yellow with orange stripes with an interesting and very uniform flattened shape. Sturdy short vine plants have excellent powdery mildew resistance and yield very well (approximately 10-12 fruits per plant). This is an excellent addition for any ornamental grower.

Blush

Blush is a long-day onion with brownish pink skins and light purple rings. It is easy to grow with vigorous foliage and produces mostly jumbo-sized, blocky-globe bulbs. Thick skins suggest excellent storage potential. Adaptation: 38-55° latitude.

Damsel

This beautiful pink tomato boasts late blight resistance and a rich and tangy flavor. A compact indeterminate habit yields globe-shaped fruits that average 10-12 oz. Damsel is specifically adapted to organic growing systems. Bred for the field, but has performed well in hoophouse trials. Organic seed.



Divergent

Johnny's first organic hybrid cantaloupe. For best flavor, we recommend harvesting these conveniently sized, heavily netted fruits at forced slip or cut from the vines when the skin is mostly yellow but still has a 30-40% green hue. Bred and trialed specifically for organic cropping systems.

Esmee

This open pollinated arugula is similar to Surrey, but with a much more rounded oak leaf. Esmee has an excellent flavor and impressive 3-D texture to add heft to salad mixes.

Flaminio

Flaminio is a higher-yielding Costata squash type. Medium to dark green with flecking; ridges are a lighter green. Plants have full bush habit, but are more manageable with moderate spines and less sprawling. Flaminio out-yielded the OP strain and other hybrid Costata types in our trials. Large, attractive male and female blossoms are ideal for edible flowers. Fruits are best when picked at 6-8" length.

Patio Baby Eggplant

The best container variety. Bright-purple flowers add beauty to this compact, edible ornamental. This true mini is well-suited for balconies, patios, and gardens. Spineless fruits for pain-free harvest.

Queen Lime with Blush Zinnia

This lovely zinnia has a Sophisticated color combination. Mostly double and semi-double 2-3 1/2" blooms with a small percentage of singles. Excellent performance and stunning color in our trials.

I fully plan to invest in the zinnias, eggplant, cantaloupe, and let's be honest here – I'll probably buy them all. If you give any or all of these a try, please let me know how they do in your garden and maybe I'll be able to do a follow-up after the growing season. If you happen to be in the area, Johnny's does offer self-guided tours from July through September, Monday through Friday, from 9:00 AM to 4:00 PM. They will give you a tour packet to augment your trip, but if you have enough people, a guided tour for a group can be arranged by calling Customer Service at 207-861-3900. This is one of my favorite seed companies, so I hope you can find some great options for your 2017 growing season online at **JohnnySeeds.com** or by requesting one of their very pretty catalogs. BC

Jennifer Louque and her family are already thinking about the garden in NC.

Holly Bee

Plant these for bees, and the holidays this year

Kurt **Knebusch** and Paul **Snyder**

Here's seven hollies that can take it when Jack Frost nips at their noses.

They thrive in bleak midwinters. They look good in the landscape all year. And you can cut stems from at least three of them to decorate your home for the holidays. And bees love them.

How would they look in your garden?

1. Winterberry, *Ilex verticillata*

Picture bare gray stems bearing gleaming red berries. That's winterberry, a deciduous holly that, unlike the evergreen English holly, drops all its leaves before winter.

"This is my favorite species of holly, with the selection Winter Red topping the list, simply for the fact that the stems are absolutely stunning when covered in red berries," Snyder said.

Winterberry is native from Canada south to Florida, west to Missouri, including in Ohio. It comes in small and large selections that range from two to 10 feet high when fully grown. It prefers damp sites but can tolerate drier ones. Birds such as bluebirds eat its berries. And its cut stems work great as natural, colorful holiday decorations.

"It holds up quite well in arrangements," Snyder said. "And it dries well if left undisturbed in a vase."

Find winterberry in many places in the arboretum's theme gardens.

2. Inkberry, *Ilex glabra*

Inkberry, too, is native to much of eastern and central North America, but especially pine woods and sea coasts. Its evergreen leaves are dark-green, obovate – teardrop-shaped – and lacking in spines. Its berries, meanwhile, give it its name. They're black. But white-berried types exist, too.

In the wild, inkberry grows as a dense, rounded shrub. In the landscape, it's a common foundation planting. At the holidays, Snyder said, it's used very little for decorating.

Spot inkberries along the arboretum's John Ford Allee and Million Flower Pathway.

3. Longstalk holly, *Ilex pedunculosa*

Longstalk holly has dark-green, evergreen, spineless leaves and an eventual height of nearly 30 feet. It makes a good specimen plant in the landscape, Snyder said. Best of all are its glossy red berries, which, as its name suggests, are borne on stalks, which are one to two inches in length.

The berries are "quite attractive and stand out from other *Ilex* species, although the fruit isn't as heavy as other *Ilex,"* Snyder said. However, he added, "It's not

widely used in holiday decorating except by plant geeks like me."

Hunt longstalk hollies in the arboretum's original holly test planting, which is south of Pine Road and Green Drive, and around the John Streeter Garden Amphitheater.

4. American holly, *Ilex opaca*

American holly is native from the Northeast south to Florida and west to Missouri and Texas. It grows in the wild in several counties in southern Ohio, Snyder said. It gets to be a small or medium tree of 40-50 feet high. But in the Buckeye State, a height of 20-30 feet is more likely, he said.

"It's slow-growing in Ohio and becomes very graceful – a pyramidal habit – with age," he said. "This plant, in my opinion, is very beautiful and well worth the wait to see a mature specimen in the landscape.

"When you come across a large specimen, there's almost a respect for the plant. It's a noble tree in its own right because it took decades to reach such heights."

The leaves of American holly resemble those of English holly. They're glossy green with sharp spines. The plant's berries are red or yellow. It needs moist, well-drained, acidic soil and, ideally, protection from the winter wind so it doesn't get burned and lose leaves.

American holly is a common substitute for English holly in holiday decorating.

5. Finetooth holly, *Ilex serrata*

Native to China and Japan, finetooth holly resembles winterberry except for two traits: Its berries are smaller. And it's semi-evergreen, not deciduous. It doesn't drop all its leaves in Fall. Some of them hang on through Winter.

"The berries are bright glossy red and hold up well as a cut branch," Snyder said. "Outdoors, the fruit persist much longer than those of winterberry, making it an excellent addition to the Winter landscape."

But finetooth holly is "not widely used for holiday decorating simply for the fact that it retains some of its foliage; winterberry is the preferred species," he said. "I've used it for decorating just to see how many species of *Ilex* I can use."

6. Japanese holly, *Ilex crenata*

Japanese holly is an evergreen type with small, rounded, dark-green leaves and a very dense branching habit. Its berries are black and hard to see because of that branching habit. Its foliage and texture resemble

those of boxwood. It can be used like boxwood in wreaths and the like.

"Japanese holly will grow in Ohio, but it's not widely planted," Snyder said. "We've lost several of them in the arboretum over the past couple of years due to different factors. But the selection Sky Pencil performs well here."

Look for Japanese hollies in the arboretum's Jack Miller Discovery Garden.

7. Meserve hybrid hollies, *Ilex* x *meserveae*

Glossy, beautiful, evergreen foliage in shades of green or bluish-green, plus glossy bright-red berries: That's what you get with the Meserve hybrid hollies. They're crosses between tsuru holly, or *Ilex rugosa,* and English holly. They're widely grown in the landscape, almost to the point of overuse, Snyder said.

Meserve hollies will grow in sun or partial shade but prefer the latter. Harsh winters can scorch their leaves. "A couple of years ago, many of them were defoliated or killed to the ground during winter," Snyder said.

They shine when used in decorating, he said, noting they're often preferred over American holly because their leaves are glossier and their spines aren't as sharp.

Find Meserve hollies, too, in the Jack Miller garden.

Remember, it takes two

Come next Spring, if you want to plant hollies, remember that the entire *Ilex* genus is dioecious.

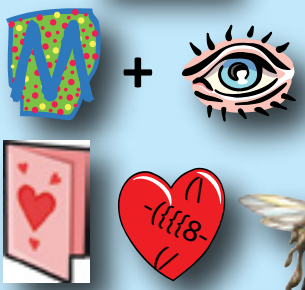
"That means that male and female flowers are borne on separate plants," Snyder said. "So in order to get berries, you need a male pollinator."

But not just any male pollinator. The male and female holly plants must belong to the same species, must be planted somewhat near each other, and must bloom at the same time. Garden center staff and other experts can tell you the right pairings and spacings. BC

All photos taken in Secrest Arboretum, Wooster, Ohio by Mitch Moser, CFAES.

All The Buzzz in...

Hello Friends,



Bee B. Queen Challenge

Make your own computer generated bee. Send it to me. We would love to see what you come up with!

Liberty Yager, 6, MO

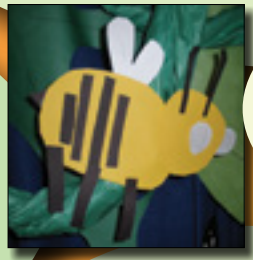
John Paul Antalek 11, OH

You Can Count on Bees

Count every single bee on this page. It is harder than you may think! Send or e-mail your number, name and address. All correct answers will be put into a drawing for a prize!

Hide and Seek

Make your own hide and seek bee game. Cut out paper bees of all shapes and sizes. Hide them in one room or all over the house. See how long it takes for your friends to find them all.



Bee Guessing Game

Make bees using beads and put them in a jar. Have your friends estimate the number of bees in the jar. The closest number wins!

Too Many Bees!

Volunteer to decorate your classroom with bees. Ask a few friends for help. Make paper bees the size of a penny and as large as a poster board to attach to walls or hang from the ceiling. Display stuffed animal bees, toy bees, fabric bees, any kind of bees. They must all be openly visible. See who can count the correct number of bees in the room. The more bees, the more challenging it is to count them all!

Bee kid's corner

Produced by Kim Lehman -www.kim.lehman.com
www.beeculture.com
February 2017

A Valentine Message

Can you decipher this quote by Victor Hugo?

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
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Computer Creations

Use a computer to create a bee of your own. Enlarge the text, print and use to make cards.

Rich Wieske from Michigan created this bee using a computer keyboard. www.greentoegardens.com.

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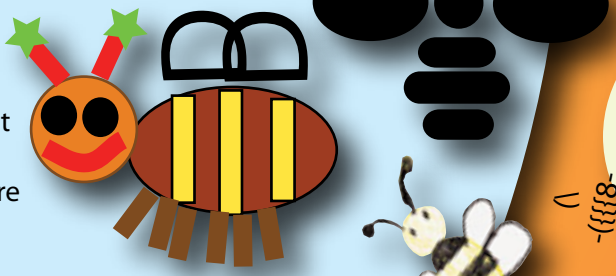
Believe it or not, Bee B. Queen came up with this computer image of herself!

Create a bee using different computer programs. Here are some examples:



Bee Buddy

Two year old Chloe insisted that she wanted to dress like a bee for Halloween. Her parents, Tom and Cory Ryan, got into the fun by dressing up as beekeepers.

Beecome a Bee Buddy

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

Name
Address
Age
Birthday Month
E-mail (Optional)

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

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

Winter? What's That?

Ann **Harman**

While Old Man Winter is delivering wind and snow to the north, let's take a little vacation way down south where the sun is shining and the days are warm. Although you might want to sit on a Florida beach, we are going to visit some busy beekeepers and see what they are doing with their bees. The large commercial pollinators have done their preparations and are ready to head west to the almond pollination event. So we will visit small-scale beekeepers from east to west. Leave your down jackets and warm gloves behind. Let's go!

Here in the south you will find something in bloom all year around. The climate is considered sub-tropical in many places. The mountains in the west will be cooler. The queen will be laying all 12 months but does decrease somewhat during October through December when the hours of daylight are declining. Unless it's raining or a surprise cold day bees will be flying and will find something useful in bloom even if it's a dandelion.

If you have a nice library of bee books that you consult frequently you may feel that they are more suited to the very large temperate area of the U.S. Information on swarming may not exactly fit what happens in the deep south. Sections on Winter cluster and Winter feed do not seem appropriate. In the south 25 pounds of honey for Winter feed is usually adequate. It can be easy to mentally shift the seasons on management. Books on bee plants may list some that grow in your area. Your local bee club can certainly provide the best information on what to do when and also for plants. A field guide for wildflowers does have good information on where a plant will grow and when it blooms. If your bee club does not have a list of honey and pollen plants for your area, then that would be a good project that would benefit members, especially ones new to beekeeping.

Let's start our visit in Florida where we will encounter the African bee although there is European stock here also. More about the African bee later. Florida once had huge crops of citrus honey, also called orange blossom honey – aromatic and incredibly delicious. Today vast acreages of citrus trees are either infected with citrus greening disease or have died from it. Florida is not the only state infected. Unfortunately the disease is in Texas and California, two other states with large citrus orchards. There are other plants for a honey crop but none as famous as citrus.

It is interesting that Florida has three different zones for honey crop plants. In the panhandle some beekeepers move bees into or close to the swamps for tupelo honey. It is one of the few honeys that will not crystallize because of the high fructose content. (This author has a small jar of tupelo honey deliberately kept at room temperature since the early 1980s – it is still completely liquid.)

In the Gulf states you need to have swarm-catching equipment ready early in the year. Although March can be considered swarm season, a surprise one can occur in February. Start looking for queen cells in February to be aware of the bees' plans to swarm. Those queen cells can be used to make nucs. If you club is giving beginning beekeeper classes then nucs with local bees are an excellent way for someone to start beekeeping. Many beekeepers find there is a good market for nucs to replace Winter losses. If the nuc can increase its population in a full-sized hive readily it would be possible to have a honey crop from it. Southern beekeepers seem to favor a Langstroth hive of one deep hive body and one medium. Colonies are not as large as in the north.

If you have thought about some small-scale pollination of crops in your area, now is the time to make plans, for you and for your bees. You need to have a contract with the grower. That is an essential part of offering bees for pollination. You can find the important points a contract should have in *ABC&XYZ of Bee Culture*. There you will see what the grower needs to do and what you need to provide. Pesticide use may be prevalent in citrus orchards so it is important to check with the grower for any spray schedule. Actually in these days of pesticides, fungicides and herbicides it is always important to ask all growers you contact for pollination about any of those to be used. You want strong colonies but since swarm season starts early in the south you need to use timely

swarm prevention management or you could lose the bees needed for early crops. Your area Cooperative Extension Service agent could help you find growers with crops suitable for small-scale pollination. The long growing season means a beekeeper could have both pollination as well as a honey crop.

No matter where you live you need to be a Plant Watcher and a Weather Watcher. If you are planning pollination of a crop the weather will affect when the grower needs you to move your hives into the crop and also out. If you are planning a honey crop you need to be ready with honey supers when the plants are ready. It is always a challenge to beekeepers to keep up with Mother Nature and the bees.

As we move through the Gulf states we will find the main nectar flow for a honey crop can start in mid-April and continue into June. Cotton is one of the main agricultural crops and a good harvest of cotton honey can be made. In the past the cotton fields were heavily treated with an assortment of pesticides. Fortunately in recent years the cotton itself and the amount and kinds of pesticides have changed. Thus cotton has become a more desirable crop for honey production.

Although year-around beekeeping does sound enjoyable the beekeepers do have to cope more with two problems than northern beekeepers – *Varroa* and small hive beetle (shb). With the queen laying all 12 months there is no real break in the brood cycle. Thus *Varroa* can live and multiply all year. Since the current treatment threshold for *Varroa* is three mites per 100 bees, frequent sampling is necessary throughout the year. Any of the *Varroa*-transmitted viruses can mean the death of a colony rather quickly. A beekeeper who is deciding on appropriate *Varroa* treatments or intervention must read the product label carefully for the specified temperature range during use. The prolonged high temperatures encountered in the south do affect what can be used when. Attention must be paid to the temperatures forecast for the duration of treatments.

Much of the soil encountered in the south is somewhat sandy. The soil type and the warm moist temperatures are exactly what the small hive beetle needs to be a very serious pest. The sparse rainfall of the desert southwest does not provide the damp soil conditions the shb larvae need to pupate. Those beekeepers, who live in the dry desert areas, and those who have African bees, may not have the small hive beetle at all.

A hive in the south may have several types of traps for shb including ones inside the hive and oil-filled trays. Bottom boards have been designed to prevent and/or trap the adult shb. Beetles or larvae seen when the hive is opened should receive a smash from the hive tool. Those who can keep free-range chickens will find they love to chase and eat the migrating larvae.

Since the shb is attracted to the odor of honey, southern beekeepers have learned how to harvest their honey crop. Two things to keep in mind – cleanliness and speed. Honey supers cannot be left piled up just waiting to be extracted on another day or they will be slimed and the crop ruined. The 'honey house' where extraction or other kinds of harvest takes place must be kept clean of spilled honey.

Let's continue westward into Texas and beyond. Texas, a very large state, has areas with different bee forage and honey crop plants. Now we have entered real African bee territory. Those beekeepers in Texas and the southwestern states learn how to keep the African bee. It is possible to requeen with European stock bees but not only is it very expensive to keep doing this but requeening an African hive with a European stock queen can be difficult and not always successful. Furthermore the African bee does a very clever job of usurping a European stock hive. So a hive thought to be filled with European stock bees can be actually filled with African bees, much to the surprise of the beekeeper.

The correct term to describe the African bee's behavior is overly *defensive.* The term *aggressive* is frequently used but an African bee out foraging is no more aggressive than a European stock bee out foraging. The African bee is super-sensitive to anything that approaches the colony, whether it is living in a beekeeper's hive or their chosen 'nest site' in a water meter cavity, an abandoned car or an unused barbecue grill in someone's back yard.

African bee beekeeping is really 'let-alone beekeeping.' They are unpredictable – one day relatively calm and quiet and the next day very defensive. They do swarm frequently but even if several swarms are cast from a colony the queen that is finally left is a prolific egg-layer and the number of bees are replaced quickly. The African bee is very good at absconding. If they consider something unsuitable the queen and all the bees will abruptly leave, sometimes leaving behind brood and food.

Fortunately they do respond to heavy smoking. A big smoker is handy and plenty of smoker fuel. It is helpful to smoke the entrance heavily and wait one or two minutes before opening up the hive. The bees will use that short time to engorge on honey and thus become more calm. Beekeepers with African bees produce honey for sale, collect pollen and harvest wax. With sufficient forage they are very good honey producers. One advantage to keeping African bees is that they do not tolerate small hive beetle or *Varroa* so these problems are not a major concern.

In Texas and westward mesquite is considered a desirable honey crop plant. Bloom time depends on the area and also on elevation. The honey crop is made in May and June but a bit later in the southwest mountains. In this area of the U.S., especially in Texas, it is important to know your climate, its plants and their bloom time. Excellent honey crops can be produced and are characteristic of the plant life in their region..

Hello Reader! Are you up north where snow is swirling around outside? Your bees are still in a Winter cluster and are making their swarm plans now so they can take action in a couple of months. Perhaps one day you will move south where you would be interacting with your bees the whole year around. Wherever you are, or will end up, learn your beekeeping area of the United States – its climate and its plants – so you can help your bees to be healthy and productive pollinators and honey producers. BC

Ann Harman knows about beekeeping in the South and all around the world. She keeps her bees in Flint Hill, Virginia.

Olivarez Honey Bees/Big Island Queens is seeking motivated beekeepers to join our Hawaii team! Experience preferred. Self-motivator and ability to work in a team environment a plus. Positions are full time, salary based on experience. Great Benefits Package. Prior work history and references required. Advancement opportunities available. Submit resume to **info@ohbees.com or Olivarez Honey Bees Inc/Big Island Queens, P O Box 847 Orland Ca 95963, Fax: 530-865-5570, Phone 530-865-0298**

Bee Pollen — An Overview

Ross **Conrad**

Bee Pollen: Implications for Human Health

Last month we looked at bee pollen: what it is; how it is collected by both the bee and the beekeeper; and some of the ways it is used by both bees and humans. This month, we will explore the constituents that make-up bee pollen and some of the potential nutritional and medicinal benefits for you and me.

Pollen Composition

Bee pollen is a highly nutrient dense food. As a result, it can be very beneficial in dealing with health issues that are either caused or aggravated by a poor diet. The composition of bee pollen can vary greatly because plant pollen sources vary by location throughout the world, as well as by season and by year in a given locality. (O'Rourke and Buchmann, 1991, Nogueira, et. al., 2012) While pollen protein contents between 2.5-61% have been reported, the average range is around 24%. (Buchmann 1986) Pollen contains all 22 amino acids humans need to survive and is especially high in proline and hydroxyproline, the building blocks for collagen. Clinical tests show that orally ingested pollen is rapidly and easily absorbed by the human digestive system. Most of its components pass directly from the stomach into the blood stream within two hours after consumption. Pollen is such an excellent source of protein that for most people, 30 grams (two tablespoons) of pollen a day satisfies the human need for amino acids (protein).

Pollen also contains monosaccharides, disaccharides, and oligosaccharides. The sugar content of bee pollen ranges from 15-50% and the starch content of pollen can be high (up to 18%). (Schmidt and Buchmann, 1992).

Pollen has been found to contain approximately 200 enzymes, coenzymes, and hormones (including growth hormones) that may be at least partially active in humans. Pollen also contains lipids (fats) primarily in the form of free unsaturated fatty acids, as well as lecithin/phospholipids (the main compounds in the structure of biological membranes), and phytosterols/cholesterol (the main precursor of bile acids and steroid hormones).

Bee pollen contains many minerals, both macro-elements and oligo-elements; bioavailable forms of trace minerals that help regulate enzymatic processes. The long list of mineral elements found in pollen include: Manganese, Iron, Phosphorus, Zinc, Copper, Magnesium, Calcium, Potassium, Sodium, Nickle, Boron, Chromium, Molybdenum, Iodine, Selenium.

There are also a notable number of Vitamins found in bee pollen. The vitamins are both water (hydro) and lipid (fat) soluble and they often act as enzyme cofactors. These vitamins include Thiamin (B1), Riboflavin (B2), Niacinimide (B3), Pantothenic acid (B5), Pyridoxine (B6), Biotin (B7), Folic Acid (B9), and vitamins C and E. (Schmidt and Buchmann, 1992)

Pollen's differing colors are primarily due to different flavonoids (e.g. red, yellow, purple) and carotenoids (e.g. yellow and orange) which besides being pigments are also anti-oxidants. These compounds have also been shown to exhibit anti-inflammatory and anti-cancer properties. Other components of pollen include: *gonadotropins*, which stimulate the testes and ovaries; *estrogenic compounds* that compete with and substitute for the body's natural estrogens at different times; and *rutin* which is anti-inflammatory, an antioxidant, and can decrease platelet aggregation

Tolerance

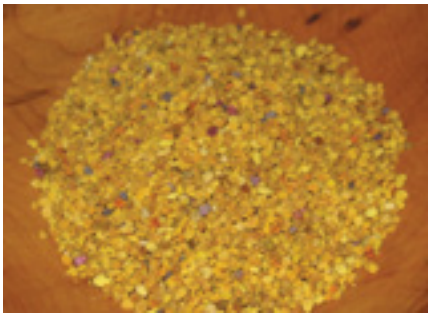
No contra-indications have been discovered when consuming bee pollen, even during pregnancy. Bee pollen has not been found to be incompatible with other medical therapies; there is no apparent tolerance buildup to bee pollen even when ingested over long periods of time. No toxicity has been reported from the consumption of bee pollen even in high dosage. The exception to this is in the case of bee pollen that is contaminated with chemical pesticide residues. Given that research has shown that bee pollen is one of the primary pathways for toxic residues to enter the hive (Frazier 2008) it is important to source bee pollen from a relatively clean (preferably organic) supplier.

Possible Negative Effects

Unpleasant side effects of consuming bee pollen may include bad taste and flavor, a feeling of nausea after ingestion, light intestinal disorder (light diarrhea) during the first day of high dosage, gastric pains (usually only when pellets are not dissolved prior to ingestion). Potential allergic reactions may include mild reactions such as shortness of breath or swelling, to severe reactions such as hives, itching, and anaphylaxis.

Bee Pollen for Allergies

The use of bee pollen in relieving allergy symptoms is based on a concept of oral desensitization where a small amount of an allergen or parts of an allergen are absorbed directly into the blood stream and the body develops a tolerance over time. While it is best to use "local" pollen, good results can also be obtained with pollen that is not local (as long as it is from the same type of plant that is the source of the allergic reaction). Local, raw and unfiltered honey has traditionally been used for this purpose but it is more efficient to use straight pollen from the plant(s) that are the source of the allergy. In addition, research has indicated that bee pollen has an anti-allergic activity because it inhibits histamine release



that is the cause of allergic reactions. (Ishikawa 2008)

One treatment protocol that has been successful for some people is to start by taking a half a bee pollen granule and then, if no unpleasant side-effects that can't be tolerated are experienced, double it the next day. Again, if no intolerable side effects are felt, double the amount again, and again until after 10 days a full teaspoon of pollen is being consumed. If side effects become too uncomfortable at any time, simply cut back the amount taken to the previous tolerable amount.

Allergy Protocol
- 1st day ½ granule of pollen 6th day 1/16 of a teaspoon
- 2nd day 1 granule of pollen 7th day 1/8 of a teaspoon
- 3rd day 2 granules of pollen 8th day 1/4 of a teaspoon
- 4th day 4 granules of pollen 9th day 1/2 teaspoon
- 5th day 8 granules of pollen 10th day – 1 teaspoon

Continue ½ to 1 teaspoon per day

Nutritional Powerhouse

Among other things, the nutritional properties of pollen have the potential to be used in cases of children's lack of appetite, developmental delay, and malnutrition of children and adults. Moreover, bee pollen is recommended for patients going through the recovery period, after surgeries, and to people working hard physically and mentally. (Attia et. al., 2011, Tikhonov et. al., 2006)

Detoxification

Numerous and well-documented studies on animals have shown the powerful detoxifying action of pollen. Rats were poisoned with organic solvents such as carbon tetrachloride and trichlorethylene, as well as ethionine and ammonium fluoride. Pollen lowered the level of these substances in the blood serum of the test animals, providing strong evidence of the therapeutic properties of bee pollen with regard to protecting the liver. However, when pollen is consumed with toxic substances, it protected liver cells from their harmful effect, which suggests pollen has the ability to prevent toxification. During the detoxifying process, an important role is played by polyphenols, mainly flavonoids and phenolic acids. (Komosińska-Vassev, et. al. 2015)

Reproductive and Sexual Function

Estrogenic and gonadotropic hormonal stimulating materials have been isolated from pollen. These materials stimulate both male and female sex organs and may explain reports of improved sexual function in men and increased fertility in woman – (Mehraban, F. 2014; Soliman F. A. and Soliman, A. 1957)

Weight Issues

One of the amino acids in bee pollen, phenylalanine, is thought to suppress appetite by acting on the region of the hypothalamus of the brain that is believed to control a person's appetite for food known as the appestat. Practicing apitherapists have found that pollen has the potential to assist in both weight gain and weight loss. Bee pollen provides about 250 calories per 100 mg of pollen. (6+tablesp)

Dr. Andrew Kochan, MD of California, former president of the American Apitherapy Society, recommends the following regimens for individuals with body weight imbalances.

Weight Loss Regimen: 20 to 40 grams of pollen with meals twice per day and between meals- more pollen

Weight Gain Regimen: 10 to 30 grams of pollen plus, 20-50 grams of honey with each meal and for snacks.

Depression

Pollen, administered alongside anti-depressants, enables the reduction in drug dosage and improves the overall condition of depressed people within a short period. This can help decrease the number of drug addiction cases involving antidepressants and help reduce the occurrence of side effects. (Komosińska-Vassev, et. al. 2015)

Bee Bread

As mentioned in last month's article, worker bees process pollen into bee bread and use it primarily to feed honey bee larva. The following recipe from Andrew Kochan, MD is recommended as a way to make bee bread at home.

Recipe: Mix 3 lbs. of honey and 2.5 lbs. of pollen in a one-gallon jar. The pollen will want to float to the top of the honey, so two or three times a day for about two weeks, the jar should be turned over forcing the pollen to float slowly back up through the honey to the top of the jar each time it is inverted. Beebread is tasty and the fermentation process adds beneficial bacterial and acids to the pollen.

For more information on the nutritional and medicinal benefits of bee pollen, contact the American Apitherapy Society **www.apitherapy.org/contact/**

Ross Conrad will be leading honey bee presentations around the country starting in late February in Burlington, VT, Schenectady, NY, Medina, OH, La Crosse, WI, Salem, OR, and in both Marin and San Mateo counties in California. For more information, visit his website at ***www.dancingbeegardens.com/events.ht*** BC

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Some Thoughts

The Climate And Agriculture

Joe **Traynor**

U.S. Agriculture, along with most U.S. citizens, is beginning to come to terms with the fact that our climate is indeed changing – that the world is getting warmer. The accumulated evidence – temperature records, melting glaciers, sea-level rise, increased frequency of weather events (including droughts) – has become too great to ignore. The argument today is between those that believe in man-made-global-warming (MMGW) and those that believe that we're in a natural cycle. If man contributes to global warming, then remedies, including an unpopular carbon tax, could help, although it could be argued that such a tax is "too little, too late". Those that believe we're in a natural cycle feel that it would be foolhardy to attempt to change something that cannot be changed.

Most nations have pledged to reduce carbon emissions (the Paris Agreement) by reducing fossil fuel consumption and emphasizing renewable energy sources, mainly solar and wind. A carbon tax designed to reduce fossil fuel consumption in the U.S. has elicited significant opposition from many businesses, including agribusiness. With the appointment of Scott Pruitt, a climate change denier from the oil state of Oklahoma, to head the EPA (if confirmed) and the likelihood of fellow climate deniers (if confirmed) occupying most or all of the cabinet posts in the incoming administration, backed by a president who believes that MMGW is a "hoax", look for a big increase in fossil fuel consumption in the coming years. Supporters of a carbon tax argue that such a tax is like buying insurance against a possible catastrophic event – that even if we may have already passed the point of no return to reduce global warming it's worth doing everything possible to avoid the projected losses that would occur should temperatures continue to rise at their current rate. Home owners spend billions of dollars annually on fire insurance against the very unlikely event (one in a thousand?) your house burns down. Even a MMGW skeptic might think it prudent to purchase insurance against potential devastating losses.

Insufficient chilling from the warm winter of 2014-2015 devastated California's 2015 cherry and pistachio crops, giving a glimpse of what could happen to the future of crops that depend on cold or even normal winters. Overall, California has far more to lose from global warming than other states – here's why: warm winter storms mean less water for our major water bank, the Sierra snow-pack. Perhaps more ominous is a predicted rise in sea level of 1.5 to six feet by 2100, pushing more seawater into the delta. Several options, all less than ideal, are available to keep seawater at bay (the San Pablo Bay): install expensive gates and barriers (some are already in place) to hold back seawater; send massive amounts of precious river water to the delta (water intended for ag) in order to, literally, stem the tide (the current preferred practice but dicey in drought years) or allow salty water from the delta to flow to the San Joaquin Valley via the state aqueduct, threatening thousands of acres of salt-sensitive almonds (salt tolerant crops like and cotton and pistachios would probably survive); this saline water would eventually reach and contaminate our already fragile groundwater reserves. More salt water in the delta means big problems for California ag. And, if an earthquake destroys levees in the delta, all bets are off as to what happens.

Farmers in the Midwestern states are not that concerned about MMGW. A good case can be made – and has been made – that a warmer climate would benefit the Midwestern farm belt by increasing the length of the growing season. A longer growing season would allow for more double-cropping and for increased diversity of crops, including those currently grown in California (almonds in ND?). If global warming crippled California farms via diminished snow-packs and salt water intrusion from the Pacific, the Midwestern states would be more than happy to take up the slack. The CA Farm Bureau, to their credit, recognizes the reality of climate change and the consequent possibility of recurring droughts; the CAFB supports increasing water storage to hold projected increased snowmelt runoff during warmer springs. Both the national and the California Farm Bureaus oppose a carbon tax, but California farmers might want to reconsider their position in light of the dire consequences that could occur as the planet warms. California farmers might consider an amicable (and hopefully temporary) divorce from their mid-western brethren on the carbon tax issue until the issue is resolved.

With much of their country below sea level, the Netherlands has battled seawater intrusion for over 100 years and has spent billions on protective gates and barriers. The Dutch certainly realize their increased peril from global warming and are currently under Court order to reduce carbon emissions by 25% by 2020. Environmental groups in the U.S. are up in arms about the total lack of concern for the environment and even the promotion of maximum fossil fuel consumption by the incoming administration. Don't be surprised if one or more groups of concerned citizens, citizens united to combat global warming, file a lawsuit to force the EPA to curb carbon emissions. Because California farmers have more at stake in the Climate game than the average U.S. citizen, a case can be made that California farmers should participate in such a lawsuit (if they are able to endure

the raised eyebrows from some of their neighbors). It's not all gloom and doom on the global warming front – the switch to renewable energy, esp. solar, has been faster than many thought possible. In 2015, 26% of California's retail electricity came from renewable sources, a huge leap in just five years. Here's UC scientist Kurt Cuffey: *"You absolutely don't want to be defeatist. If we reduce the rate that we are sending carbon fossil fuel into the atmosphere, we could probably limit further warming to a degree"* (California Magazine, Winter, 2016).

As with any issue, politics is involved in global warming discussions. Most MMGW skeptics are Republicans, believers Democrats. The Republican party line (with strong support from the fossil fuel industry) is that cheap energy from fossil fuels is vital and that a carbon tax would cripple our economy, including our ag economy. Democrats argue that the consequences of a warming planet are too dire to ignore – that we should be good stewards of our planet for future generations. The fossil fuel industry spends millions of $ supporting congressional candidates who fear being "primaried" if those $ went to a new kid on the block – one that toes the fossil fuel line.

California farmers that might favor purchasing some degree of climate insurance in the form of a carbon tax would need California congressmen, including Kevin McCarthy, to get on board. This would be an uphill battle, fighting headwinds (and oil money) all the way since straying from the party line could end an office-holder's career. As politicians age, most start thinking in terms of "legacy" (see *Brown, Jerry*) and it is here where Republicans could be vulnerable to carbon tax arguments. If the chances of dire consequences from global warming are only one in a hundred, a good argument could be made that it would be wise to purchase insurance against such consequences rather than face the possibility that in 2100, our great grandchildren will ask why we did nothing to cool our planet years ago. Who would want their legacy to be that they were on the wrong side of what could well be the most important issue that the world, and California agriculture, has ever faced?

Joe Traynor, December, 2016

GLEANINGS

FEBRUARY 2017 • ALL THE NEWS THAT FITS

KRISPN GIVEN RECEIVES PROMOTION

Krispn Given demonstrating some of the techniques for Dorthy Morgan of Ohio.

Recently Krispn Given was promoted to Apiculture Specialist at Purdue University, for 13 years Krispn has been working with Dr. Greg Hunt at Purdue University's department of entomology. His responsibilities include maintaining the 120 research colonies, running the Purdue honey bee breeding program, teaching an annual queen rearing short course, managing the honey bee laboratory and extension activities. Krispn also teaches the instrumental insemination class each year at the university, gives lectures to beekeepers around the country. His current breeding focus has been on selecting for behavioral resistance to *Varroa destructor* and grooming behaviors. Dr. Greg Hunt and Krispn Given developed the "mite-biter" strain of bee's that is starting to generate much interest around the country for beekeepers and breeders of honey bees.

Recently (2014-2015) Krispn and Greg conducted a comparison study with 39 beekeepers where they looked at Winter survival and number of mites per colony using three commercial sources against two Purdue sources. A total of 22% commercials and 59% IN mite biters survived; with 63% commercial and only 26% mite-biters dying over the Winter! Commercial colonies had 3x more mites.

With constant selection Dr. Greg Hunt and Krispn Given have achieved about 50% chewed mites in there research colonies!

Krispn Given with his 2016 instrumental Insemination class at Purdue university's honey bee laboratory.

ZAMBIA PLANS BIG HONEY HARVEST EXPANSION

Zambian company Bee Sweet Honey announces an ambitious US$40-million program to manufacture and distribute two million environmentally friendly bee hives across the southern African country.

Bee Sweet Honey director John Enright tells reporters there is a need for investment in honey quality control and the entire value chain be cause of the growing demand for honey, especially in Europe.

Enright says once fully operational, the program will involve more than 70,000 people at project sites throughout Zambia.

The company expects honey income to reach US$120 million a year.

Alan Harman

COLD, WET SPRING THREATENS AUSSIE BEES

Beekeepers in Australia say a cold southern spring weather could affect the pollination of fruit and nut crops in Victoria state next year.

The Australian Broadcasting Corp, reports the cool and wet conditions reduced nectar in native trees, significantly reducing food sources for bees.

Gippsland beekeeper Mick Camilleri tells the ABC that normally budding and producing nectar in early December are bare.

"At the moment, we're having a very stressed time with the bees because there's no nectar around," he says, "Because the trees haven't put on any buds."

Camilleri is seriously concerned about whether he will be able to meet pollination contracts next year. The almond industry is of particular concern because of the huge reliance on bees to pollinate crops.

"Seeing as the bees are so stressed out from not getting food, us beekeepers could lose our bees," he says.

Camilleri is feeding his bees bags of sugar syrup to keep them alive. mixing one part sugar to one part water in a bucket, before filling snap lock plastic bags with the syrup.

"I go down to the bees and I sit them on top of the hives of the bees on the frame," he says. "Then I put a couple of pin holes in there, three little pin holes so the syrup starts to run out and the bees star sucking it out."

Camilleri says feeding sugar syrup to the bees is a last resort, but he said he had no other choice, because there is so little nectar on trees the bees are at risk.

He says he see the situation just by looking at his hives.

"If the honey was going, they'd be working like billy-o (very hard)," he says. "But they're not. They're just sitting around. There's nothing for them to get."

Another problem is because of this stress the bees are not laying brood and this means lower bee numbers next year.

Victorian Apiarists Association president Kevin MacGibbon tells the broadcaster he is particularly concerned that lack of nectar is a problem for beekeepers right across the state.

"So far, we're getting no honey at all," he says.

"We're a bit concerned that the whole [summer season] would come and go and we'll end up with starving livestock instead of honey running up to our elbows."

– Alan Harman

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CALENDAR

♦INTERNATIONAL♦

45th Apimondia International Congress will be held September 29 to October 4 in Istanbul, Turkey.

For more information visit **www.apimondia2017.org**.

♦ALABAMA♦

The Alabama Cooperative Extension 2nd Annual Beekeeping Symposium will be held at the Clanton Conference and Performing Arts Center, February 4.

Speakers include Jamie Ellis, Phil Craft, Keith Fielder and Geoffrey Williams. Registration starts at 8:00 a.m. Lunch is provided with pre-registration by January 20.

Visit **www.mell-base.uce.auburn.edu/wconnect/CourseStatus.awp?&course=C170204A&Publish=ANYWAY**.

Alabama Master Beekeepers Symposium will be held February 9 at the Clanton Conference and Arts Center.

Featured speakers are James Tew and Jerry Hayes.

Contact Gerry Whitaker, **whitsfarm@centurytel.net**.

♦ARIZONA♦

9th Annual Organic Beekeepers Chemical Free Conference will be held March 3-5 in Oracle at the YMCA Triangle Y Ranch Camp and Retreat.

Speakers include Michael Bush, Laura Ferguson, Don Downs, Karen O'Brien. Cost is $225/person which includes lodging and meals.

For information visit **www.tucsonymca.org orwww.groups.yahoo.com/group/organicbeekeepers/** or contact Dee Lusby, evenings at 520.398.2474.

♦CONNECTICUT♦

Back Yard Beekeepers Association 2017 speaker schedule – February 28, Aaron Morris; March 28, Carl Jurica; April 25, Frederique Keller; May 23, Christina Grozinger; September 26, Tom Seeley; October 31, Kirk Webster; November 14, Jennifer Berry.

For information visit **www.backyardbeekeepers.com**.

♦DELAWARE♦

EAS 2017 - University of DE Newark, July 31 - August 4.

Speakers include Larry Connor, Mike Embrey, Maryann Frazier, Clarence Collison, Allen Hayes and more.

For information visit **www.easternapiculture.org**.

♦GEORGIA♦

GA Beekeepers Association will hold their meeting February 17-18 at the University of GA, Griffin Campus (an hour from Atlanta).

Speakers include Marla Spivak, Michele Colopy and Charlie Parton.

For information visit **www.gabeekeeping.com/**.

♦ILLINOIS♦

LCBA Bee Seminar will be held March 18 in Mettawa at the Grainger Company.

Speakers include James Amrine, Gordon Wardell, Jon Frank, Dave Hackenberg.

For more information **www.mettawabeeseminar.com**.

♦INDIANA♦

IN Bee School XV will be held February 25 at Decatur Central High School, 5251 Kentucky Avenue.

Guest speakers are Sue Cobey and Tim Tucker. You must pre-register, no walk-ins.

For information visit **www.Indianabeekeeper.com**.

♦KANSAS♦

The KS Honey Producers will hold their Spring meeting at the Ramada Convention Center in Topeka, March 10-11.

Keith Delaplane is the guest speaker. The theme is Second Year Beekeeping and Beyond. For hotel reservations call 785.234.5400 and mention KS Honey Producers.

For information visit **kansashoneyproducers.org** or contact Joli, 913.593.3562 or **joli@heartlandhoney.com**.

♦MARYLAND♦

Maryland State Beekeepers will hold their Winter meeting February 11 at the Howard County Fairgrounds, West Friendship from 9:00 a.m. to 3:30 p.m..

For more information visit **www.mdbeekeepers.org**.

♦MISSOURI♦

Eastern MO Beekeepers will host their 10th Annual Beekeeping Workshop and Banquet in St. Louis February 11 at Maritz in Fenton. Registrants are encouraged to attend the Mardi Gras Banquent on February 10.

Instructors will include Becky Masterman, Jessica Helgen, Paul Kelly, Daniel Thurston.

Tuition is $85/person by January 22, $95/after than. The banquet is $30/person and registration closes February 5. Lunch in included along with cour materials.

For information visit **www.easternmobeekeepers.com** or **info@easternmobeekeepers.com**, 314.669.1828

♦OHIO♦

Medina County Beekeepers Beginner's Classes will be held five Tuesday evenings beginning February 21 through March 21, at Bee Culture Conference Room in Medina taught by Bee Culture Editor Kim Flottum. Saturday classes are at the Medina Library, February 11 & 25.

Visit **www.medinabeekeepers.com,calendar**.

♦NEW YORK♦

Southern Adirondacks Beekeeping Assembly be held March 4 at TECSMART, Malta.

Speakers include William Hesbach, Peter Borst and Dale Hill.

For more information contact **alavitabile@yahoo.com**.

♦OKLAHOMA♦

The Oklahoma State Beekeepers Association will hold its Spring conference March 4 at the First Baptist Church, Duncan, 901 W. Ash Ave.

The SW Oklahoma Beekeepers Association will hold their meeting March 3 at 7:00 p.m..

Jeff Armstrong is featured speaker for both meetings.

For more information contact pat Tickel, **patokbees@gmail.com** or 580.795.4619 or visit **www.okbees.org**.

Northeast Oklahoma Beekeepers Association will present the Big Bee Buzz March 31 - April 1 in Tulsa.

Speakers include Marion Ellis, Phil Craft, Katie Lee, Megan Mahoney and Beth Conrey. The cost is $35.

More information online at **NEOBA.org**.

♦PENNSYLVANIA♦

Western PA Beekeeping Seminar will be held February 17-18 at the Doubletree by Hilton in Monroeville.

Featured speakers include Roger Hoopingarner and Doug Oster. There will be breakout sessions on pollinators, nutrition and more. A Beginning Beekeeping workshop will be offered in tandem on Saturday (limited to 75)

Cost is $55; Beginning Beekeeping cost is $75.

For more information visit **www.extension.psu.edu/beaver** or call 724.774.3003.

♦VIRGNIA♦

The 6th Annual Mid-Atlantic Organic Honey Bee Convention will be held March 4 at American Legion Post 242, 21 J.B. Finley Road, Sandston. The cost is $50/person or $90/family.

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

♦WYOMING♦

The Wyoming Bee College will be held March 18-19 at the Laramie County Community College, Cheyenne.

Featured speakers are James Tew and Les Crowder and others. The cost is $75 which includes meals.

For information visit **www.wyomingbeecollege.org**, **www.eventbrite.com** or call Catherine, 307.633.4383.

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Happy Valentine's Day

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It broke my heart yesterday when Mike came for our steers Jem and Buttercup.

In the Spring we bought Buttercup. We wanted Summer mowing, and later, steaks. But Buttercup got lonely. He found the weak link in the fence and pushed on it. Steers do that. He settled in two doors down in some tall grass by the ditch. He slept under an apricot tree. Sometimes he'd visit the horse in a corral across the road. I couldn't get within ten feet of him.

A week later Dolores from the feed store brought over her halter-broke 4-H steer Jem. As soon as she let Jem out of the trailer, Buttercup and Jem bonded, love at first sight. So when Dolores led Jem back to our place, Buttercup followed right along. Both steers bawled when Dolores took Jem away.

I told her, "Buttercup needs a friend. If you hear of anybody with a steer for sale, let me know, would you?"

A few weeks later she called and said she'd part with Jem. I paid too much for him, but I didn't care too much. Now Buttercup had a sidekick and a reason to stay home.

Jem liked me to scratch behind his ears and always tried to knock the bucket out my hand when I brought range cake treats. Do you know how much a yearling steer weighs? Jem affectionately stepped on my foot once.

The two animals had a fine Summer and Autumn together grazing and sleeping in the orchard. Now it's December and time for them to go. I don't much like it, but this was the plan all along. An idyllic life and then one bad day.

A record warm fall ended one clear night two weeks ago when the mercury dipped to the teens. A week later we were below zero. I had top feeders on a few colonies. Those bees had mostly taken their syrup before the weather turned, but some of the little darlings hadn't quite cleaned up their plate. I left the feeders on – for insulation, and for feed, when it warms up.

Here at the house honey buckets lie littered everywhere as we struggle to fill Christmas orders. Three sit warming in front of the woodstove. Once contains thicker-than-molasses honeydew honey. Honeydew is the sweet secretion of leaf-eating aphids, leafhoppers and psyllids. Bees sometimes use honeydew to make honey. You're a gardener, right? You know how your rose leaves curl up, with aphids thick on the undersides of the leaves. The leaves feel sticky with sweet honeydew.

Here in western Colorado, oak brush occasionally produces honeydew. You know honeydew honey when you see it and taste it. It can be as black as a Coca-Cola and has a rich, strong, sometimes caramel taste and texture. Europeans consider it a delicacy. Have you noticed? In this country, the Euros are always looking for "dark honey."

I usually call it "aphid-spit honey." This intrigues some folks and makes others gag, but overall it makes a great sales pitch. I sell a lot of honeydew honey, when I can get it. I didn't have any of my own, so I swapped with Paul for some. Slowly granulating, it's thick like room-temperature butter, or 90-wieght gear lube. I can get it out of the tap if I warm it in front of the fire first. It's fine. It's raw.

Another raw honey we sell is naturally granulation-resistant Flat Tops wildflower. The Flat Tops are the high country north from here to Steamboat Springs. Up there bees make honey from mint, coneflowers, high rabbit brush, and blossoms you've never seen or even heard of, like dwarf waterleaf.

We sell the Colorado River valley alfalfa/clover honey for a little less than the aphid-spit and the wildflower. It's generally what we get the most of. I only sell it as "raw" when it's fresh out of the

hive. You take a coffee break, and it'll granulate on you. Once it turns, you need a sharp knife to get it out of the jar. So we do what we need to do to provide our customers with liquid honey, which is generally what they want.

Some beekeepers heat their honey and then call it "raw." One major Colorado honey packer markets its honey as "raw and unfiltered." One of their reps gave a talk at our state bee meeting. He said they heat it to 125 degrees and then strain it.

"Raw" can mean whatever you want it to mean, I guess. For us, raw means raw. If we heat honey to a high enough temperature to melt sugar crystals, we no longer consider it "raw." As for filtration, we use the twin miracles of gravity and time to naturally strain our honey.

Marilyn's cattle dog Pepper acted surprised tonight when he ran down to the steers' empty pasture. He likes to give 'em the blue heeler "strong eye." Those two are surely in cow Heaven by now. Pepper's going to miss the boys. So will I.

Ed **Colby**

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