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JUL 2010

Bee Culture

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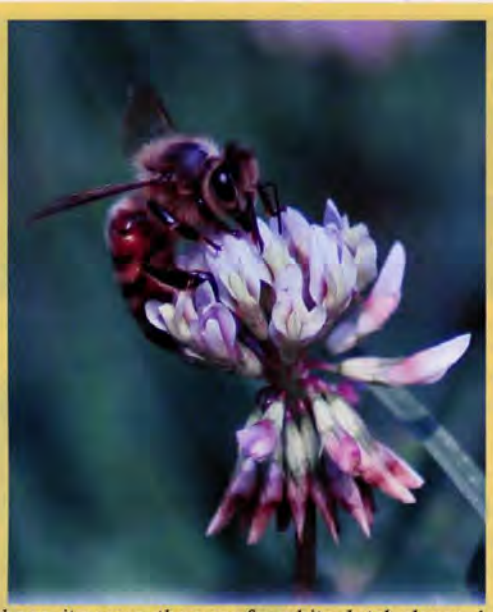

It has been, it seems, the year for white dutch clover. A nearly universal citizen of lawns and pastures and unused fields, seed is inexpensive to purchase, it is easy to establish and maintain, and in a good year, an acre of it will produce something like a 100 pounds of honey for a colony. Imagine what 100 acres and 100 colonies could do. photo by Bill McGiffin

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Bee Culture

THE MAGAZINE OF AMERICAN BEEKEEPING

JULY 2010 VOLUME 138 NUMBER 7

FEATURES

DEPARTMENTS & COLUMNS

GLEANINGS-71, CALENDAR-76, CLASSIFIED ADS-77

DEPARTMENTS & COLUMNS

GLEANINGS-71, CALENDAR-76, CLASSIFIED ADS-77

Varroa Mite Traps

To Ross Conrad:

I have enjoyed reading your articles in *Bee Culture* magazine and have your book Natural Beekeeping.

I have tried to find *Varroa* mite traps and the "bait" to lure them in. Do you have a good suggestion for both?

I suppose I could place drone brood frames in each of my hives, but I am reluctant to have the bees spend the time and energy on raising the brood if I am just gong to kill them with the mites.

Any ideas and contact information for sources would be greatly appreciated. Thank you for your time.

John Lunsford
Anacortes, WA

Ross's Response: *Thank you for your email message and your kind words about my writings in* Bee Culture *and* Natural Beekeeping.

I fully understand and share your reluctance to kill the drone brood in an effort to keep mites under control. To trap mites without using drone comb, Natural Beekeeping *is the only source of information I am aware of. If you are not able to manufacture your own trap from the plans in* Natural Beekeeping, *I could sell you one of my used traps for $15 plus shipping and handling.*

Methyl Palmitate can be purchased from a chemical supply company. A search on the web should produce some options such as ***www.chemexper.com/chemicals/supplier/cas/112-39-0.***

Most supply companies prefer to deal with large orders, but you might get them to sell you a "sample" of their methyl palmitate (about a pound which would last you a long time) after asking about pricing for 55 gallon drums or some such thing. At the time that I last purchased some, I was considering starting a business manufacturing and selling mite traps so the company that sold me my methyl palmitate: Advanced Scientific & Shemical, 2345 SW 34th Street, Fort Lauderdale, FL 33312, was happy selling me a small amount as a sample since they were hoping to get a large order out of the deal.

Reinstate Merit Badge

The letter from Christopher Stowell has peaked our interest.

We have been officers in our club since it's beginning; the wife and I along with two others began the club in the early 90s and have added, as well as lost, members along the way. (Expense seems to be the largest hindrance in this vocation, along with bee loss)

We've been trying to teach groups in the area but haven't a budget to do much; volunteers are difficult to recruit!

However, we are interested in helping the youth to be good bee ambassadors. We have helped the 4-H in the past but there are NO Boy Scout troops in our area. Should there be any forming, we would be happy to do our part to educate these guys and 'gals'.

As far as merit badges, this is an internal affair of the scouts but we will do what's necessary to see the 'students get credit.

I checked for an address, home or email, for Chris and didn't find one. I do have some information to help with this project if he were to contact me **dholesapple@live.com**.

Dave

Editor's Note*: Christopher Stowell, Troop 250, Skiatook, OK, is a beekeeper and is petitioning the Boy Scout Council for reinstatement of the Boy Scout Beekeeping merit badge that was discontinued in 1995. To sign the letter and petition, visit "The Buzz" page at* ***www.helpthehoneybees.com/#buzz****.*

Honey Region Of Origin

Several of your readers responded to an advertisement last year, asking for volunteers with stationary beehives to participate in a research project. That research was part of an effort to develop techniques to determine the geographic origin of honey. Today, we are excited to share some of our preliminary results.

We found the stable isotope ratios of both honey and beeswax vary systematically across the United States. Thus, we believe the stable isotope analysis of a bee product can be used to determine its geographical origin worldwide. The data are extremely promising and we have written and published several scientific papers on our results. But we do not feel our work is complete. Now that we have a model to predict honey region-of-origin, we need to test it with samples from known locations. To that end we hope your readers will help. We are again asking for volunteers to send samples of honey, honeycomb, and water.

In order to share more details about our work, we have written a general introduction to stable isotope analysis, which will appear as an article in next month's issue of *Bee Culture*. Until then, if anyone would like more information about our research – or would be willing to volunteer samples – please contact us.

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SW ID Beekeeping

The bees wintering in SW Idaho came through with about normal losses - nothing earth-shattering (i.e., CCD) is apparently not wide-spread for the local hobbyist beekeepers. However, the bouts of cold weather in between warm spells have knocked the Spring-buildup back two to three weeks. Exceptionally strong hives going into Winter have been able to tolerate the inclement weather. Average or weaker hives have borne the brunt and appear to be somewhat late. Local queen-rearing, package bees and nuc (nucleus hive) production have been delayed. Swarm season kicked off last week and the number of swarm reports is expected to grow through the remainder of April and May.

While not a lot of comment has been received concerning the status of the mite population, *Varroa* continues to take a toll on local

➢

hives. Mite populations are beginning to ramp up with Spring colony growth and the mite-related problems are anticipated to continue to be a problem throughout the season.

On the positive side, the Treasure Valley Beekeepers Club, our local club, continues to grow with interest spreading all across SW Idaho. Last weekend, The Noyes family hosted over 100 beekeepers at their operation in Fruitland, ID. Beekeeping demonstrations were provided and Club members picked up nucs and package bees. This was a great event for all local beekeepers.

Steve Sweet
Boise, ID

Danger!

I would like to comment on an article in the April issue of *Bee Culture* – Bees Warn Hive Of Dangerous Situations. After reading it over several times I realized it could also have the answer to nest searching scouts and how the final decision is made before the swarm moves toward their new home.

Briefly – when scouts pick a new site they try and recruit other scouts to their site. This process goes on for quite some time (a week or more) but before the final decision is made all nest scouts disappear from the new home and stay at the cluster. Now what mystifies me is how is this done. These scouts are spread out from the new home back to the cluster. There are some times, more than a hundred, depending on the site of the swarm. But when the decision is made the scouts start to gradually get less and less until there are none. So does one nest scout become a "stop" sign to other scouts and they in turn do the same to others, this would be done at the cluster, although I've seen a lot of bumping and running at the new site which I refer to as excitement. I have no idea what this means. But this stop sign could be another part of the puzzle. Thanks to James Nieh.

Jim Cowan
Aberdeen, WA

200 Top Bar Hives

I read with much interest Dr. Tew's April 2010 column article on top-bar hives. I have always appreciated his wisdom, and on this subject I would like to offer my experience too. I began beekeeping at age ten and by high school had 125 frame hives. During my undergraduate college days, I had to sell them to make ends meet.

In the Spring of 1986, I started my beekeeping over again, beginning with three top-bar hives. Eventually I built that operation to 200 top-bar hives, exploring a commercial application of that hive design. I moved the 200 (as two-foot long) hives by hand, working alone, using a truck and trailer for crop pollination for about 10 years. From recycled wood I made the hives for as low as five dollars each and rented them for spring cucumbers for $40. With proper handling, comb breakage was not a problem. One person can easily pick up a hive, though conservatively together they weighed about eight tons.

In addition, top-bar hives are good for queen rearing. In the queen cell production hives, the horizontal design permits quick access to the cell bars, and the top-bar mating nucs are fun to work. I also used top-bar hives for package bee production. One season I shook 70 three-pound packages for a friend who took a bad hit from *Varroa*. I had no comb breakage problems with that either. While selling honey is not my main focus, others produce cut comb honey from the naturally built combs. They sell it in plastic containers by weight in niche markets at lucrative prices and without expensive extracting equipment.

At the Eastern Apicultural Society (EAS) meeting this August in North Carolina, I am scheduled to give three talks on top bar hives: how to make them, not only from wood but from weed and sunflower stalks, literally home grown hives; top-bar hive management; and scientific research with top-bar hives including data from having 100 of them on screen floors where I counted over 400,000 *Varroa* mites during four years. In some situations, the simplicity of the top-bar hive design is a strategic, low cost, advantage and can support a beekeeping operation of at least a few hundred colonies.

Wyatt Mangum
Fredericksburg, VA

Always More To Learn

After reading about botulism in honey by Mr. Tompkin in the March 2010 issue of *Bee Culture*, it seems quite mysterious how the botulinum spores enter the honey. Ross Conrad had some good questions. The bacteria cannot multiply in honey, as Tompkin said, and we know that bacteria in the bee stomach prevents any other harmful bacteria from multiplying in the nectar as it ripens into honey. I think he said spores were only detected in 5.1% of the samples in 1996, and he did not say what percentage of those had the 10 to 100 or more spores per serving.

One thing that came to my mind is the possibility that the spores could be in the honey containers before the honey is. I see lots of ways for the spores to enter old canning jars which are very often used for bottling honey. You know, empty jars are left on the top shelf in the cellar and then someone raises a cloud of dust while dumping the potato harvest into the potato bins. No one thinks about the jars – just rinse 'em out before you fill 'em with honey – it's perfectly safe for adults... or someone uses the jar as a vase for some flowers yanked out of the dirt . . . How many spores would be left after washing a jar in the sink? How many spores would be in the water it was washed in? The processing methods should have been looked at for those honey samples that were found to contain spores. We know that a few botulism spores are harmless to adults, so what levels of the spores could be expected to remain on the surface of "clean" glass jars later used for honey, especially if you live in the west coast States? Most of all, has any research been done to test honey straight out of beehives, entirely unprocessed? That would at least give us a better understanding of when the spores enter the honey. What about dust settling into supers while in storage?

Anyway, I am happy that education is sufficient to address the problem, and not regulation! Beekeepers and honey processors, let's ➢

keep educating our customers.

Michael Staddon
Salem, WV

Getting "Stung"

We have some midnight beekeepers in the area of Wisconsin and Minnesota who are in the business of stealing hives of bees. Another way they work is to offer you a service of wintering your bees in the south. They offer to pick up your bees and bring them back in the Spring. You may or may not get all of your bees back, you may only get half of them and they may not be in your equipment. You might end up with a lot of junk.

What drives these people to steal? Is it the price of honey and the demand or is it the glory of being able to have enough hives to go for the Almond Gold of pollination out in California? Will it help to have all your equipment branded or your name painted on everything? I am not sure but it might help a bit. On the night of the April 26 or 27 I lost 33 good one-story hives that were ready for the second box. In 2009 I lost a lot more through shady wintering in the south arrangement. Are these two related? This person knew where one of my best beeyards was located. What can you do to prevent this? Don't fall for a wintering deal without a signed contract of exactly how it will go, have all your equipment with your ID and never show them where your yards are.

Dale Wolf
Baldwin, WI

Women Beekeepers

I very much enjoyed Tammy Horn's article on *Women & Beekeeping in Langstroth's Time.* Another important women's venue from that era was the Italian Bee Co. established by partners Mrs. Ellen S. Tupper and Mrs. Annie Savery at Des Moines in 1865. Mrs. Tupper was known as the "bee queen" of the west and lectured on bees and their care at the Iowa State Agricultural College. She edited several bee journals. The beekeeping community was dumbfounded when in 1876-77 she went on trial for forgery and swindling; she interposed the insanity defense.

Matt Redman
Chestertown, MD

Nosema Disturbing

This USDA report on Nosema and virus disturbs me very much about the testing of nosema and colony collapse. I've been studying colonies that have collapsed for the last three years and 95% of them have had a high nosema spore count at an alarming stage. I've taught many seminars teaching beekeepers how to address this situation and what to look for and what to treat with. 96% of the beekeepers that have used my recommendations have had a high number of the colonies survive but the ones who ignored the information have had high numbers of colonies die. I have experts that tell me that I don't have a clue what I'm doing but every time a new report comes out it supports what I've been telling these people for three years.

I have come to find that colonies that have been fed with medicated syrup with fumagelin b added that are treated with a half gallon in the Fall and half gallon in the Spring with no supers on have survived in high numbers. The controls that weren't treated, 90% of them died. I started with 32 colonies that were treated with the fumagelin b and syrup mix in the Fall and then wintered and we had a survival rate of 30 with a loss of two after winter. All colonies measured less than 1% nosema ceranae present. Colonies treated with just syrup and no medication out of 30 colonies, only one survived the Winter and 29 died. All of these colonies were tested for nosema in the beginning of Fall and the spore count was very low. It only takes a few hundred spores to be present in a colony at a time of any confinement of bees to the colony over three to four days without medication for the spore count to jump from 100 spores per bee to 50 million spores per bee. All equipment must be sterilized, once this infection is started, with heat because the spores have a four-year shelf life. I did this testing and study in 2008-2009. Since we have begun treating our colonies with the fumagelin b in the Spring and Fall we have had minimal losses due to other situations and our spore count has dropped down to almost ZERO. I have found the spore counts of nosema in mites and hive beetles alike and they can be carriers of this disease. We found the biggest thing for survival is to keep the bees healthy and strong, keep off pesticides, and keep stress levels down, and the bees will take care of the hive beetles and mites but you have to medicate them with the antibiotics.

We've been told many times that we have no clue what we're talking about but your report shows what we've known for two years. We've tried to pass this on to other agencies and they just laugh. People need to face the fact that this is the cause, the Europeans have known all along. People need to treat their bees and stop looking for other causes because this is the main factor. If you have any questions you can contact me.

David Kelton
Gadsden, AL
www.lookoutmtnhoneybees@tds.net

Safety First

As a professional in the safety field and an active beekeeper, I would be negligent if I didn't comment on a photo in the June 2010 issue. On page 49, the upper left photo shows two beekeepers being raised by a forklift on top of a pallet box to access a swarm. Neither person is conforming to OSHA regulations for proper fall protection nor is the forklift attachment meeting the OSHA guidelines for such use.

A swarm of bees, though important, is not worth risking serious injury or death. Note that statistically one out of every five falls results in death. An excellent magazine such as Bee Culture should review submitted photos so that the wrong message is not portrayed as "acceptable" behavior.

Bruce Guiliani
Bargersville, IN

INNER COVER

Dave Cowen retired this past Spring.

If you get to any of the bigger meetings you've met Dave, or at least you saw his display . . . it was that great big stainless uncapper/extractor/wax thing/tray thing/tank/ automatic everything loading and unloading piece of equipment that just might have been on the Starship Enterprise. Lately, he's had it at meetings all set up in a trailer out in the parking lot . . . you know the one, the trailer with the line of guys outside at one end waiting to get in, and a bunch of guys outside at the other end by the exit door all standing around with their hands in their pockets, kickin' stones, tradin' lies and just oozing testosterone.

Big pieces of equipment do that at meetings . . . get guys to drooling that is. There's just something about a couple tons of brand new, shiny stainless steel, motors, rollers, blades and levers that gets under your skin. Normal guys, guys that run operations that wouldn't warrant one of these in a thousand years start to thinking that maybe they could, and maybe they should, and wouldn't having one, maybe one of the smaller ones, be just so cool and what would the guys in the club think about *that,* and I wonder what the wife would say. And the guys with outfits large enough to actually handle one of these start to get pumped because they only have smaller equipment, or older equipment, or not enough equipment, and they start to think about refitting the honey house this summer if almonds work and the crop looks good and I wonder if I could talk the wife into *that.* And the really big guys, they already got what they want, but they come around just to kick the tires to see if Dave got it right, and maybe steal another good idea like last time.

Dave started working with his Dad back in 1972, making extractors. He'd had bees already so had a handle on what beekeepers needed. So did his dad. Now his boys do, too . . . Joshua, who's focused on design work, and Nate, whose specialty is production and assembly, because they bought the business. There are 13 employees that make all that stainless steel sing, uncap, extract, load and unload and spin and empty and push and move and make honey.

I've been lucky enough to know Dave for over 20 years. We did a story on his operation a bunch of years ago, before his boys were involved, and his dad, though retired, was still telling Dave what he'd done wrong.

"It's a good time to move on", Dave told me.

"There's lots of business in the pipeline right now so the boys will have enough to do, and the industry has changed so much . . . it's harder to keep bees, and it's such a mobile business now, and the big get bigger and the smaller guys have to push that much harder.

"Now it's time to put some time in the motor home and house boat", he said.

I bet we see him at the next big meeting, though, watching his boys do all the work now. But he'll still be standing knee-deep in testosterone oozing from the next generation of beekeepers who are saying to themselves, "Man, that is some cool heavy metal, wouldn't that mean machine make my life easier. I wonder what the wife would think about *that*?"

Thanks for making beekeeping a little bit better Dave, and have fun.

•

Another long timer on the Social Security hit list this Summer is Dr. Clarence Collison. It was back in 1984 that his first article appeared on these pages entitled *Testing Your Beekeeping Knowledge* . . . that's more than a quarter century ago. He was Extension Entomologist at Penn State then, with beekeeping being one of his responsibilities. He kept up his *Testing* column until 1989 when he moved from Penn State to Mississippi State to take the helm of the Entomology and Plant Pathology department there. He came back to us in 1992 and with his *What Do You Know* column until 2000, when we changed formats to what you see today in the current *A Closer Look.*

Clarence got his beekeeping start at Michigan State studying pollination and bee behavior, and when he moved to Penn State he looked at pesticide problems, more pollination issues, drone production in a colony, and several aspects of *Varroa* biology.

During much of this time Clarence has been very involved with the Eastern Apiculture Society Master Beekeeper program, and hundreds of beekeepers have challenged Clarence in that duel of what do you really know about bees and beekeeping, though thousands read his contributions every month on these pages. He is one of our most popular authors.

But after just over 21 years in Mississippi, it's time to move to the lake house in Tennessee, which he and his wife Sally are planning to do soon. He wants to keep up the column here, and we want him to, so we won't be missing that part of his contributions to beekeeping, and as I understand it, he'll keep beekeepers on their collective toes in his role as EAS Master Beekeeper guru for the time being.

We published a book containing more than 2000 of his questions and answers a few years back, and it remains a popular addition to our collection here. It's required reading for anybody who wants Master in front of their beekeeper title, and if you've read the book, Clarence's columns over the years, or taken his test, you know how much you need to know to make it past his red pen.

Dave Cowen, &
Clarence Collison
. . . plus,
Enough Good Food

I've had the good fortune to be able to work with Clarence all these years, and to interact closely with his Master Beekeeper program when I was working with EAS. I simply can't imagine his column not being a part of our monthly project here...and though I envy the cottage on the lake, I'm glad he'll keep us thinking . . .

Thanks, Clarence, for all the work so far, and keep it up...you're one of the good guys.

•

Enough Food

All bee things considered – mites, pesticides, viruses, disease and magic spells – when it comes to honey bee health the one thing recognized but barely addressed, and not even close to being solved is . . . good food.

Again and again the fickle finger of famine points to a lack of diversity, the lack of quality and quantity, and very few alternatives when it comes to finding a healthy honey bee diet. Of course other pollinators, beneficial insects and animals and wildlife in general live in the same food-scarce locations, eat the same nutrition-poor foods, and suffer the same malnourished fate – starvation amidst acres and acres of plenty.

It is, certainly, easier to tackle any of the aforementioned problems with good, even mediocre science because there is something to measure – lots of mites before, then few mites after some action is taken for instance; or measure the poison now, quit pouring the poison in then measure the poison again. Less poison later gives you some measure of success, or at least change.

But food. Good food. Enough food. Enough good food all the time. That's a tougher metric. We know that in a lot of places enough good food all the time is nonexistent. Pesticide-saturated row crops just don't make today's blue plate special. And even where there is good food, or enough food those places where there's enough good food all the time are rare, and even now are disappearing beneath the pavement, the plow and the persistent spread of people. We are, as a species, committing genocide on a multitude of species by the simple, yet very effective act of systematically removing their food and starving them to death.

To offer assistance, at least to honey bees, we move them from one short term food fix location to another, then another and another like cattle grazing along a fence – eat it all here, move on and on and on. Remember the dust bowl? Maybe not but the similarities can't be ignored. We take everything we want and leave behind the worst of our sins. Nature gets even.

There's been some help from those who keep bees. The best so far, the feeds that feed bees and keep them alive are based on science then made in secret or made in public for everybody to use. But there's been little help from the lab bench in years, little indeed. There are, as you know, a hundred different kinds of dog food . . . for old dogs, fat dogs, young dogs, and the same for cats and gerbils and canaries . . . but those choices for honey bees don't exist . . . dogs and cats just eat, but bees . . . bees feed us. Is there something wrong with this picture?

But it's not all over but the shouting. In fact the shouting has just begun. On several fronts wise people are planting good food, enough food and encouraging others to follow their lead. The pollinator people certainly are concerned and are forging ahead with ways and means to feed the hungry. See what they do at **www.pollinator.com**. Those floral grocery stores are helping.

And finally for honey bees, the Friendly Farmer program is helping too. See them at **www.pfspbees.org** (partners for sustainable pollination). These are good people helping honey bees and other bees. And they're helping your bees.

Check out these programs. Move out of Movento country. Move to a Bee Friendly Farm. Your bees will be really glad you did.

•

Good grief! It's July already. What happened to Spring? But July is the right time to pause for a bit to appreciate those who have already and those that are still making sacrifices in unsafe, far away parts of the world. The Fourth Of July is a celebration, but it's also a quiet time for hope and prayer that those who aren't home return safely.

Keeping safety in mind this holiday, keep your veil tight, your hive tool sharp and your smoker lit...or your holiday fireworks will be right there in your hives.

*This hive tool thing. I'm not kidding about keeping a good sharp edge on that most important tool. It should be sharp enough to slice paper. A sharp edge makes scraping burr comb off top bars faster, safer and easier. A sharp edge fits between the end of a frame's lug and the side of your super so much better, and a sharp edge cuts comb off the bottom of a medium frame that was in a deep box oh, so much nicer. In fact, I'll bet you haven't sharpened your hive tool in...what, five years? Well, no, you probably haven't had the one you're using now that long because you lost your other two last year, right? But I'd still bet it's so dull you couldn't cut ice cream with it. Get a file, a stone, whatever, and get an edge on that hive tool, today. You won't believe the difference. Really.

JULY – REGIONAL HONEY PRICE REPORT

Compared To Last Year And Before . . .

It's time for a mid-year review of where prices are going. By now many beekeepers have a handle on what the honey crop will, or at least might be at the end of the season, and those who are careful are adjusting prices to reflect the demand they are seeing, and the crop they have to meet that demand. Early farm market prices this year are up a bit over same time last year, and bulk prices remain high.

The big regional chart below is the regular monthly chart we produce each issue, but the chart up here reflects the average honey price for each product drawn from our regular report for July 2007, '08, '09, and now '10… a four year review of mid-year prices.

During these last four years the economy has gone through some significant turmoil, and generally prices for most goods have remained relatively low. Overall, inflation has risen only 5.1% during that time, according to the Consumer Price Index, calculated by the U.S. Bureau of Labor Statistics.

If honey had held to that figure then, the price per pound bulk, which is now $1.63/lb, would have been only $1.14. The real increase then reflects a 51% increase. I wish my house had the same selling power. But not all products on this chart reflect that same increase. A 60# pail of light honey is up only 15%, the wholesale price of 1# jars is up only 8.5%, a retail bear is up 16%, a retail 1# jar is up 22%, and pollination is up 18%.

Overall, if you want to do the calculations, you'll see the trend is that bulk prices and retail prices show the greatest increase…averaging somewhere around 17 or 18%, give or take. Meanwhile, wholesale prices have not fared so well, averaging 10 – 12% increase. Still, with the rest of the universe dealing with only a 5% increase for most products, honey has done quite well in the last four years. But the pinch at wholesale means that those sellers are paying more for bulk, and getting less when selling to retailers, who are marking it up more…ouch.

Interestingly, the product with the greatest leap forward has been dark wax. But wax in general has been difficult to get because of two years of short honey crops. A good honey crop this year might help that…buy why dark wax, do you suppose?

MID YEAR PRICES

EXTRACTED HONEY	2007 Avg.	2008 Avg.	2009 Avg.	2010 Avg.
55 Gal. Drum, Light	1.08	1.53	1.56	1.63
55 Gal. Drum, Ambr	0.97	1.26	1.41	1.51
60# Light (retail)	117.32	123.22	133.29	135.13
60# Amber (retail)	113.82	118.75	127.20	126.78
WHOLESALE PRICES				
1/2# 24/case	48.47	53.96	61.76	58.81
1# 24/case	71.65	74.33	80.55	77.77
2# 12/case	59.99	62.18	70.44	70.29
12.oz. Plas. 24/cs	57.64	60.46	65.31	63.61
5# 6/case	71.30	74.55	79.60	80.12
Quarts 12/case	89.51	95.88	102.77	101.74
Pints 12/case	55.35	65.07	63.08	65.61
RETAIL SHELF PRICES				
1/2#	3.04	2.87	3.36	3.32
12 oz. Plastic	3.28	3.59	3.78	3.82
1# Glass/Plastic	4.06	4.65	4.68	4.94
2# Glass/Plastic	6.74	7.30	7.55	8.15
Pint	6.34	6.93	7.46	7.67
Quart	10.37	10.51	10.26	12.90
5# Glass/Plastic	14.82	16.28	17.15	19.09
1# Cream	5.43	5.16	5.67	6.42
1# Cut Comb	5.96	6.32	7.17	6.83
Ross Round	5.66	5.99	6.49	6.60
Wholesale Wax (Lt)	2.34	3.17	3.92	3.55
Wholesale Wax (Dk)	1.84	2.76	3.59	3.83
Pollination Fee/Col.	64.46	81.12	68.85	75.80

REPORTING REGIONS

	1	2	3	4	5	6	7	8	9	10	11	12	SUMMARY Range	SUMMARY Avg.	History Last Month	History Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS																
55 Gal. Drum, Light	1.65	1.85	1.65	1.50	1.60	1.75	1.63	1.50	1.65	1.65	1.58	1.56	1.50-1.85	1.63	1.56	1.56
55 Gal. Drum, Ambr	1.52	1.65	1.52	1.50	1.50	1.44	1.61	1.50	1.40	1.52	1.45	1.55	1.40-1.65	1.51	1.49	1.41
60# Light (retail)	130.00	126.33	130.00	132.50	120.00	145.00	130.83	130.00	150.00	131.84	145.00	150.00	120.00-150.00	135.13	131.83	133.29
60# Amber (retail)	130.00	116.67	130.00	130.25	120.00	120.00	121.67	130.00	100.00	131.30	142.50	149.00	100.00-149.00	126.78	127.39	127.20
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS																
1/2# 24/case	55.20	61.98	40.60	57.00	74.00	54.00	46.09	66.93	66.93	45.36	54.75	82.90	40.60-82.90	58.81	59.29	61.76
1# 24/case	75.12	79.78	84.00	57.58	76.00	86.08	74.78	68.68	72.00	84.00	86.70	88.50	57.58-88.50	77.77	81.76	80.55
2# 12/case	69.90	74.72	66.60	63.13	69.00	70.02	67.29	81.00	57.50	85.00	56.70	82.60	56.70-85.00	70.29	72.96	70.44
12.oz. Plas. 24/cs	68.16	74.98	50.40	65.67	60.00	63.80	58.44	68.24	66.00	56.40	60.45	70.80	50.40-74.98	63.61	63.68	65.31
5# 6/case	85.62	77.65	78.00	74.00	84.00	96.00	74.90	90.37	72.00	70.20	68.75	90.00	68.75-96.00	80.12	75.97	79.60
Quarts 12/case	70.00	110.88	118.02	103.42	96.00	101.52	95.14	98.00	100.00	117.24	93.95	116.67	70.00-118.02	101.74	110.96	102.77
Pints 12/case	71.21	56.95	71.21	58.88	68.50	58.57	69.14	64.68	84.00	59.16	58.00	67.00	56.95-84.00	65.61	65.52	63.08
RETAIL SHELF PRICES																
1/2#	3.00	3.56	3.00	3.36	3.91	3.00	2.86	3.91	3.25	2.75	2.76	4.50	2.75-4.50	3.32	3.10	3.38
12 oz. Plastic	3.50	3.79	3.35	3.64	3.99	3.78	3.38	3.74	4.90	3.27	3.88	4.63	3.27-4.90	3.82	3.86	3.78
1# Glass/Plastic	3.75	5.01	4.97	4.44	5.48	5.10	3.92	4.79	6.17	4.45	4.84	6.41	3.75-6.41	4.94	4.85	4.68
2# Glass/Plastic	7.50	7.42	8.41	7.38	9.50	8.18	7.35	9.50	6.15	7.25	8.07	11.13	6.15-11.13	8.15	8.17	7.55
Pint	8.69	8.38	8.69	6.66	6.48	5.86	6.79	6.22	11.00	7.81	6.15	9.33	5.86-11.00	7.67	7.55	7.46
Quart	16.00	12.48	14.58	10.56	12.00	10.28	10.15	10.87	18.00	14.32	10.17	15.44	10.15-18.00	12.90	11.60	10.28
5# Glass/Plastic	17.00	15.99	21.97	21.85	21.21	19.75	18.99	19.00	21.00	15.19	17.09	20.00	15.19-21.97	19.09	18.85	17.15
1# Cream	11.55	5.86	6.50	5.49	5.25	5.30	7.71	6.39	5.00	4.90	5.37	7.75	4.90-11.55	6.42	6.19	5.67
1# Cut Comb	6.50	5.34	6.50	5.20	6.93	5.83	7.38	6.00	6.93	8.50	7.33	9.50	5.20-9.50	6.83	6.76	7.17
Ross Round	6.96	4.65	6.50	5.00	6.96	6.50	6.25	6.50	6.96	6.96	7.50	8.50	4.65-8.50	6.60	6.67	6.49
Wholesale Wax (Lt)	2.25	4.00	2.50	2.64	2.15	5.10	4.42	4.00	4.75	4.00	2.68	4.08	2.15-5.10	3.55	3.51	3.92
Wholesale Wax (Dk)	2.25	3.48	2.40	2.41	2.00	5.00	3.58	4.00	5.00	3.56	2.77	4.10	2.00-5.00	3.38	3.16	3.59
Pollination Fee/Col.	90.00	102.50	70.00	37.67	86.52	61.25	57.00	65.00	86.52	86.52	50.00	116.67	37.67-116.67	75.80	76.17	68.85

PESTICIDES & Honey Bees

Few topics elicit more emotion and testimonials than a discussion of pesticides and honey bees brings forth. The role of pesticides in the demise of colonies due to CCD is unknown.

Christi Heintz · Gabriele Ludwig

The Apiary Inspectors of America (AIA), in collaboration with USDA-ARS, have recently published a report on losses of overwintering honey bee colonies. This past Winter, beekeepers again lost over a third of their colonies. *Figure 1* illustrates the past four years of the AIA surveys.

How can an industry that pollinates nearly $15 billion in food crops continue to suffer these losses? A sustainable U.S. food supply is dependent upon sustainable pollination services. Since the onset of Colony Collapse Disorder (CCD), beekeepers have suffered devastating losses and many have ceased their operations. CCD is theorized to occur when bees are stressed and malnourished and in combination with other factors such as the presence of Nosema and viruses, but the cause isn't known exactly.

While CCD has put some beekeepers out of business and caused colony rental fees to increase dramatically, it has brought awareness to the role of honey bees in pollinating crops and the importance of honey bees and native pollinators in a healthy, biologically-diverse ecosystem. CCD has facilitated more in-depth discussion and more research on the impact of pesticides on honey bees.

Few topics elicit more emotion and testimonials than a discussion of pesticides and honey bees brings forth. The role of pesticides in the demise of colonies due to CCD is unknown. Nonetheless, much has been discussed and written about the topic of pesticides and honey bees. Many point the finger at pesticides with the assertion that grower-applied pesticides are our major honey bee problem.

The authors have had many years of experience in orchard crops, honey bees and pesticide registrations. The following perspective is provided to boil down the issue to manageable, logical and practical measures. These ideas are meant to be used as a springboard for future discussions on pesticides and honey bees.

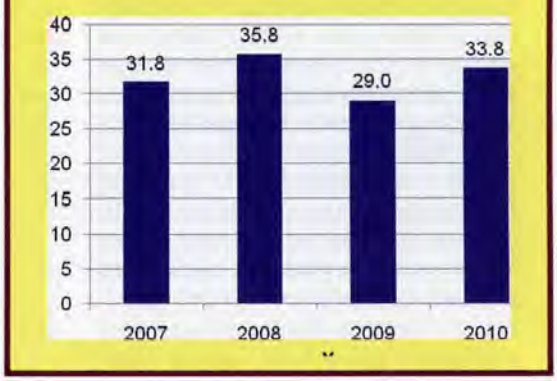
Factors to consider in honey bee – pesticide discussions

CCD is not caused by one factor such as pesticides. Whether you are watching a documentary, reading a book, an article or listening to a speaker, if the source says they know the cause of CCD and that it is a single factor, head in the other direction. The top research institutions and bee scientists in the nation say that CCD is most likely caused by a "perfect storm" of several factors converging at the same time. The AIA survey reported starvation of overwintering colonies to be the number one reason for loss of the colonies. Pesticide debates should consider the pros and cons, facts and figures, known and unknown factors relative to only *pesticides* and allow the CCD discussion to continue on a parallel track. The two tracks may intersect at some point perhaps, but at this time, they are valid and distinct research topics.

The highest concentrations of pesticides found in honey bee hives are beekeeper-applied pesticides. Research by Pennsylvania State University, in collaboration with USDA-AMS in Gastonia, North Carolina, and also by Washington State University has revealed an incredible number and diversity of pesticides present in honey bee colonies. Beekeeper pesticide dialogues must address the wide-spread detection of coumaphos and fluvalinate in hives. These two pesticides are, by far, the most common pesticides found in bee hives. These are a beekeeper-applied organophosphate and a beekeeper-applied synthetic pyrethroid. Neither is classified as "reduced risk" chemistry and both have resistance issues. Another point to address that affects the beekeeper's side of the pesticide debate is the presence of amitraz. Amitraz is a miticide currently no longer registered for use in hives, is used very little in crops, but residues are found in honey bee colonies. Amitraz is among the top eight most frequently occurring residues in hives. Beekeepers need to use pesticides for managing health. However, critical comments by beekeepers about growers' use of pesticides to the EPA must first gain credibility by addressing and acknowledging these shortcomings on the beekeeper side of the equation.

Consider that beekeeper-applied and grower-applied pesticides are not currently being held to the same

Figure 1. **Over-wintering Colony Losses**
AIA, USDA-ARS, 2009



standard. Beekeepers use a range of pest control tools to reduce pests affecting the health of their hives, just as growers use a range of tools to minimize damage from plant pests. In crop protection discussions, the label is the law. A pesticide label contains the proper concentration, method of application and the legal crops or use of the product. Many growers have the benefit of using Pest Control Advisors (PCA's) who undergo training to use chemical products properly. California growers fill out specific paperwork on the pesticides they use. If a pesticide residue is detected in a grower's product, for which there is no tolerance set for the pesticide residue, the food is considered adulterated in both U.S. and export markets. Meanwhile, a beekeeper may travel from state-to-state or jurisdiction-to-jurisdiction and his pesticide applications may go unreported and are probably not recommended or administered by a trained PCA. To be sure, more research needs to be conducted on the impact of grower-applied pesticides on honey bee health. But equal effort should be placed on more available products and proper application of beekeeper-applied pesticides.

Figure 2. **Honey Bee Pesticide Representative's Proposed Job Duties:**

- Pursue and manage pesticide registrations for honey bee pest and disease control
- Cultivate and oversee research needed for
  - new registrations of beekeeper-applied pesticides
  - toxic and sub lethal effects of pesticides and honey bees
  - assessing impact of pesticide combinations on bee mortality and bee behavior
- Track pesticide registrations and their impact on honey bees for grower-applied pesticides
- Educate EPA and registrants (chemical companies) on honey bee physiology
- Coordinate communication between registrants and insect toxicologists

The EPA is looking for credible data, knowledge of the process and patience. The EPA is becoming clear and open in making changes in pesticide registrations; however the EPA cannot base regulatory decisions on testimonials or insufficient research. EPA transparency is helpful, but what is most needed, is credible data and systematic evaluations meeting regulatory standards. With good, scientifically verifiable data, the EPA will consider both toxic and sub lethal effects of pesticides on bees and will make changes in favor of protecting honey bees. It is not only a question of the data meeting Good Laboratory Practices (GLP) requirements, but there has been insufficient data for the EPA to put results into context. For instance, if a pesticide application reduces longevity of an adult bee, how significant is that to the colony? If a reduction occurs in the production of bee bread due to a fungicide application, how significant is it to colony health? Researchers involved in studying the impact of pesticides on bees should be in contact with EPA to better understand the data EPA needs as it is generally not the same data as required for journal publications. The beekeeping industry should encourage scientists to work on pesticide toxicology and the scientists should be working with EPA. The industry must realize the process takes time.

There is much to be learned about the impacts of pesticides on honey bees and whether an observed effect is actually detrimental to the colony. A steep learning curve lies ahead for all involved in pesticide and honey bee issues. Acquiring good data that is reproducible and that will stand up to the rigors of time and review requires patience and a methodical approach. But it will be well worth the effort. Beekeeper representatives should be prioritizing research gaps, determining the studies that need to be conducted and the type and quality of data that EPA needs to make improvements in pesticide registrations for both beekeeper-applied and grower-applied pesticides. The beekeeping industry should be systematically identifying and chipping away at the work to be done to keep the industry sustainable long-term.

Beekeepers need to pool resources to develop and fund a full-time honey bee pesticide representative job position. Resources for beekeepers do not mirror resources available to larger agricultural commodities. About 1,000 commercial beekeepers service all the pollinated crops in the country. Most rent to 6,000 almond growers in February and then move on to service many other growers and other crops. This relatively small, but vital industry is represented by three different national organizations; however, not one paid employee is dedicated to pesticide issues and regulations. The presence of a professional beekeeping advisor on pesticide research and regulatory processes would greatly assist in using the limited resources wisely. Several beekeepers attend meetings with chemical companies and the EPA, but do so on their own time and for the most part, at their own expense. The National Honey Bee Advisory Board is organizing to better address pesticide issues with registrants and the EPA, but again, this is a volunteer activity. A full-time employee in this endeavor could work with registrants, with the bee industry and with growers on beekeeper-applied and grower-applied products. Beekeepers need to work on legal tools for pest control and a full-time beekeeping industry representative should be paid to work on pesticide product development and to lend credibility to the registration process. See *Figure 2* for an outline of the duties of the beekeeping industry representative's job.

In particular, the industry representative should direct research toward new, "softer" products needed for *Varroa* that enable management of resistance. Alternatives for control of Nosema are necessary. Currently, beekeepers use one product, the antibiotic fumagillin. For a disease as

Figure 3. **How Misinterpretation of Pesticide Data Can Occur**

- Watch out for data that:
  - Is taken out of context
  - Is insufficient to draw real conclusions
  - Has not been verified or reproduced by credible sources
  - Is being extrapolated from one species to another
  - Only tells a small part of a much larger story
- Detection may not necessarily signify an adverse effect
  - Technology has advanced to find very small concentrations
  - Adverse effects are dependent on dose

significant as Nosema, having only one antidote is an invitation for rapid development of resistance and future disaster.

The beekeeping and grower communities should press for a toxicologist position at a research institution. A research toxicologist solely dedicated to honey bee pesticide/toxicological issues is needed at the national level or within USDA. This scientist should interface closely with the EPA on honey bee related issues. There is currently scattered research on various possible sub lethal effects of individual or combinations of pesticides on honey bees with little systematic review of effects on honey bee physiology and behavior. Data on the sub lethal effects of pesticides is sorely needed. While the effect of acute pesticide exposure is known, little information is available on their effect on bee behavior, foraging, learning, reproduction and longevity. These variables also need to be assessed with respect to pesticide combinations. Impact on individual bee vulnerability to a pesticide needs to be evaluated along with the effect on the colony as a whole. Again, these consistent methodologies need to be developed within the context of open communication with the EPA.

Employ Best Management Practices (BMPs) for pesticides to produce a win-win scenario for beekeepers and growers. As BMPs are being developed for beekeepers in the areas of nutrition, pest and disease control and colony management, emphasis should also be placed on BMPs being developed for both beekeeper-applied and grower-applied pesticides. For beekeeper-applied pesticide applications, Integrated Pest Management (IPM) programs should be introduced, developed and promoted that include timely monitoring for pests, assessment of thresholds, a pest control strategy when needed and an evaluation of the control measures. Management practices or control strategies to minimize pest problems should be employed first, with chemical controls only used when needed. BMPs are a more familiar concept among farmers and orchardists. Very thorough BMPs have been developed to protect air quality and water quality. Grower BMP's for the application of pesticides should be re-visited to insure they adequately consider the presence and protection of honey bees. Proper BMPs for grower-applied pesticides would include methods to minimize pesticide/honey bee contact and reducing stress on honey bees caused by the use of chemicals. Applying fungicide sprays at night instead of during the day when bees are collecting pollen would be an example of a simple grower BMP. Together, beekeepers and growers can work together to mitigate the impact of pesticide applications on honey bees.

Pursue a diplomatic and balanced approach in pesticide dialogues. Achieving bee industry goals for beekeeper-applied and grower-applied pesticide applications not only requires dedicated individuals involved in the process, patience with the research, and development of mitigation procedures, but also diplomacy in policy debates. Beekeepers need to keep their bees alive. Again, the significant overwintering losses are not sustainable for either beekeepers or the crops they pollinate. Healthy crops are necessary to sustain the agricultural industry, to provide feed for bees and to generate beekeeper income via rental fees. The crops need protection from pests and diseases via use of various compounds. A registration process can become too complicated or too expensive for a potential registrant to pursue a much-needed and "soft" pest control product. Even reduced risk chemicals, essential oils like thymol, are classified as pesticides and need to be registered. It is unrealistic to render all pesticides illegal or unaffordable for use. There are some organizations whose ultimate goal is to ban pesticide products. These organizations do have full-time specialists knowledgeable about the registration process and also full-time toxicologists to pursue their objectives. Be mindful of the misinterpretation of data that might be employed to influence policy *(Figure 3)*. Ultimately, we need to balance the beneficial uses of pesticides with the risk they pose to non-target species.

Figure 4. **Industry Strategic Planning for Pesticides:**

- What is the future industry strategy for careful, judicious, legal means of pest management?
- Who will follow through on the regulatory process for needed pesticides for honey bees?
- How can the industry better support registration of biopesticides like essential oils?
- Where can funding be obtained to support the necessary studies to register safe products for bees?
- How do we determine the steps that can be taken by beekeeper and grower to minimize any lethal or sub lethal effect of grower-applied pesticides on bees?

Beekeepers need industry strategic planning and direction. Over-riding the pesticide-honey bee issue is a larger dilemma facing the beekeeping industry. This is an industry that needs strategic planning. With several national organizations and some research organizations representing the beekeeping industry, the industry is fragmented in its purposes. Addressing the pesticide issue would be a top priority in industry strategic planning. Only at this level can the important questions such as outlined in *Figure 4* be addressed. There are resources that can be tapped to help the honey bee. The USDA developed the Interregional Research Project Number 4 (IR-4) to assist minor crops obtain EPA tolerances and new registered products for pest control. Project Apis m. has successfully secured two different California Specialty Crop Grants totaling nearly $350,000 to improve diagnostic services and to develop programs to better service pollinated crops.

The pesticide – honey bee dilemma can be used to help the industry in many ways. Better products can be developed, the registration process better understood, and our bees can be better protected from pesticides. But perhaps the most significant accomplishment could be using the pesticide – honey bee dilemma to act as the springboard for the beekeeping/pollination industry to initiate a strategic planning exercise to unify, organize and more appropriately address industry challenges. BC

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a closer look

QUEEN RECOGNITION & RETINUE FORMATION

Clarence Collison
Audrey Sheridan

Mandibular gland secretions attract workers over a distance, while the tergal gland secretions promote, maintain, and stabilize the court through contact chemoreception.

Honey bee queens are attractive to their workers, due partially to the complex pheromonal bouquet they secrete. Pheromones produced by the queen are secreted from a number of glandular sources and have both primer and releaser effects. Primer pheromones affect the physiological state of the individual while releaser pheromones elicit immediate behavioral responses from recipient honey bees. Mandibular gland secretions from queens are a powerful attractant to workers and serve as one of the cues responsible for eliciting retinue behavior from workers, which involves antennating, licking, and grooming the queen. The workers making up the retinue acquire and distribute her pheromone messages to other workers throughout the colony. These messages, which may or may not involve the same chemical components, inhibit reproduction by workers (worker egg-laying), control swarming and the production of queens, act as nestmate and queen recognition cues, and regulate worker tasks critical to colony growth and survival. They are also important outside the colony during mating flights and swarming.

Within the brood nest, workers close to the queen orient towards her forming a 'court.' They are attracted to join the queen's court by pheromones from the queen's mandibular glands (Gary 1961, Velthuis and Van Es 1964), the abdominal tergite glands (Renner and Baumann 1964, Velthuis 1970) and perhaps the Koschevnikov glands in the sting apparatus (Butler and Simpson 1965, De Hazan et al. 1989). Vierling and Renner (1977) suggested that pheromones from both the mandibular glands and the tergite glands are needed for the formation of a stable court.

While queen mandibular pheromone (QMP) is attractive to worker honey bees, it is not solely responsible for eliciting retinue behavior. A synthetic blend of five mandibular gland components [9-keto-2-(E)-decenoic acid (9ODA); 9-hydroxy-2-(E)-decenoic acid (+/- 9HDA); methyl p-hydroxybenzoate (HOB); and 4-hydroxy-3-methoxypheylethanol (HVA)] has been shown to be as active as the mandibular gland secretion in eliciting retinue behavior in honey bees of North American origin (Slessor et al. 1988, Kaminski et al. 1990, Plettner et al. 1997). However, an intact functional queen is still able to elicit a greater retinue response (Slessor et al. 1988), indicating that additional pheromones, other than mandibular gland secretions, must be involved in mediating this behavior.

To identify the remaining unknown compounds for retinue attraction, honey bee colonies were selectively bred to have low response to synthetic QMP and high response to a queen extract in a laboratory retinue bioassay. Workers from these colonies were then used in the bioassay to guide the isolation and identification of the remaining active components (Keeling et al. 2003). Four new compounds were identified from several glandular sources that account for the majority of the difference in retinue attraction between synthetic QMP and queen extract: methyl (Z)-octadec-9-enoate (methyl oleate), (E)-3-(4-hydroxy-3-methoxyphenyl)-prop-2-en-1-ol (coniferyl alcohol), hexadecane-1-ol, and (Z9,Z12,Z15)-octadeca-9,12,15 trienoic acid (linolenic acid). These compounds were inactive alone or in combination, and they only elicited attraction in the presence of QMP. There was still unidentified activity remaining in the queen extract. The

"Tergal gland secretions have a releaser effect that evokes retinue behavior from worker honey bees."

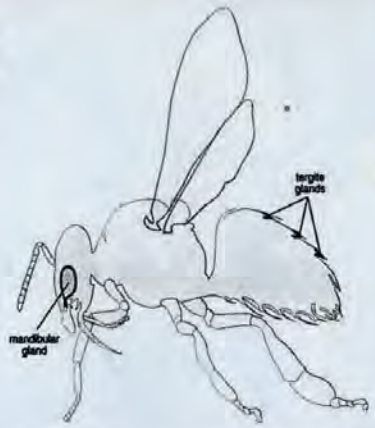
queen therefore produces a synergistic, multi-glandular pheromone blend of at least nine compounds for retinue attraction, the most complex pheromone blend known for inducing a single behavior in any organism.

Early observations of the queen's court indicated that both the heads and abdomens of mated queens received a lot of attention from the members of the court, but the abdomens were palpated and licked by a larger number of workers for longer periods of time (Butler 1954, Free et al. 1992). The queen's thoraces received the least amount of attention. Evidence for the abdomen being an additional pheromonal source accumulated, with the tergal glands possibly being responsible for the secretion of these additional pheromones (Renner and Baumann 1964, Velthuis 1967, 1970, Vierling and Renner 1977).

An alternative proposal was that the abdomen was more attractive to workers as a result of the translocation of queen mandibular gland secretions over the surface of the queen (Velthuis 1972). However, two arguments favored the abdomen having its own source of pheromone production (Wossler and Crewe 1999). Slessor et al. (1990) demonstrated that during grooming, queen mandibular pheromone components, other than 9-ODA, were often not detectable on queen thoraces and abdomens. Moreover, the 9-ODA concentrations were also much lower on the thorax and abdomen compared to the head and legs of the queen suggesting that translocated 9-ODA cannot be solely responsible for the attractiveness of the abdomen in eliciting retinue behavior. Secondly, queen abdomens are very much more attractive in eliciting retinue behavior than thoraces, indicating that the attractiveness of the abdomens cannot be due to the translocation of mandibular gland secretions across the thoraic cuticle but only as a result of the abdomen having its own source of pheromone production (Velthuis 1970, De Hazan et al. 1989). It could be argued that the larger surface area of the abdomen over that of the thorax results in more bees coming into contact with the abdomen and, consequently, making the abdomen appear more attractive; nonetheless, there remains a large body of work in support of the abdomen having its own source of pheromone production.

Further evidence suggesting that abdominal secretions have releaser

Mandibular and tergite glands of the queen honey bee. (Winston and Slessor 1992)



effects is the formation of normal retinue behavior by workers exposed to queens without mandibular glands or to isolated abdomens (Velthuis 1967, 1970, Velthuis and Van Es 1964, Butler et al. 1973, Vierling and Renner 1977, De Hazan et al. 1989, Winston and Slessor 1992, Free et al. 1992). Even without mandibular glands, queens were accepted by the colony and evoked retinues of the same size that intact queens did (Velthuis 1970). These abdominal releaser pheromones originate in the tergal glands. However, abdomens are completely effective only when combined with queen mandibular gland secretions. This observation leads to the belief that the mandibular gland secretions attract workers over a distance, while the tergal gland secretions promote, maintain, and stabilize the court through contact chemoreception (Velthuis 1972, Vierling and Renner 1977).

The attractiveness of virgin queen tergal gland secretions and queen mandibular pheromone to worker honey bees was tested using a retinue bioassay (Wossler and Crewe 1999). The number of workers attending the treated pseudoqueen lures was video-recorded in order to allow for the quantification of attractiveness. Queen mandibular gland secretions were more attractive than tergal gland secretions. These laboratory bioassays definitely indicated that queen tergal gland secretions have a releaser effect that evokes retinue behavior from worker honey bees. The tergite glands of the queen are found on the dorsal surface of the abdomen and consists of large subepidermal glandular cell complexes near the rear of some of the tergites, or dorsal plates (Winston and Slessor 1992). Free et al. (1992) observed that the abdominal tergites posterior to the tergite glands were licked for longer than those anterior to the glands. Only worker bees very near to the queen reacted to her and joined her 'court.' Mandibular gland secretion attracts at distances beyond several centimeters, whereas that of the abdominal gland only if the workers make direct contact (contact chemoreception) with the pheromone source (Vierling and Renner 1977).

Decyl decanoate and longer chain-length esters of decanoic acid were dominant components of the extracts of abdominal tergite glands of virgin queens, three to 10 days old. The esters were either absent or else present in very small amounts in queens which were zero to two days old (Espelie et al. 1990). It has been reported that tergal gland activity in virgin queens reaches a peak at mating age (De Hazan et al. 1989, Smith et al. 1993). The less volatile long-chained tergal gland hydrocarbons (Smith et al. 1993) may not be ideal for long distance communication (Velthuis and Van Es 1964), but they are readily perceived within the hive. There is no quantitative data indicating how much tergal gland secretion is produced per queen per day. It is known the secretion is continually produced and released onto the exterior surface of the tergum rather than being stored in a reservoir (Renner and Baumann 1964, Velthuis 1970, Velthuis 1990), but the amount of secretion present at any given moment in time is unknown.

The production of queen tergal gland alkenes was found to be stimulated by natural mating and not by instrumental insemination. Carbon dioxide, physical manipulation of the sting chamber and vagina, presence of sperm in the spermatheca, egg production, and chemicals transferred via drone semen were demonstrated to not initiate the synthesis of the tergal gland alkenes. The compounds probably do not function as sex pheromones (Smith et al. 1993).

Wossler and Crewe (1999) concluded that they could not be certain that the tergal glands are the only abdominal glands secreting pheromones which

are attractive to the workers. The Koschewnikow glands associated with the sting apparatus, may also secrete a pheromone eliciting attendance from workers. Some evidence for the attractiveness of these secretions has been presented (Butler and Simpson 1965, De Hazan et al. 1989). BC

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LANGSTROTH'S Maryland Roots

Matt Redman

Though commonly associated more with Philadelphia and Ohio, the Langstroth Family has a history in Maryland, too. Historian Matt Redman has detailed that history here.

Rev. L. L. Langstroth, Father of American Beekeeping, was born on S. Front St. in Philadelphia, near Independence Hall, on Christmas Day in 1810. His mother was Rebecca Amelia Dunn. The seat of the Dunn's in Kent County was known as *Broadnox,* a patent named after a notoriously cruel man who shows up numerous times in the Archives of Maryland. After being accused of killing one of his servants he was subjected by the court to a special test known as the blood test. With a death sentence at stake, the accused is required to stick his thumb into the body of the alleged victim; if the corpse bleeds then this evidence serves as a conviction. According to the deposed testimony of Thomas Wetherell, ". . . Captain Thomas Bradnox did touch the Corps...and thrust his Thumb vpon his body to shew how his flesh did dent and stirrd and shogd the Corps . . ." As Wetherell, upon his oath, ". . . did not in the leaste see any blood come from the Corps . . . ," Broadnox passed the test. He likely would have been acquitted but he died before the trial ended.

Robert Dunn became the subsequent owner of the *Broadnox* tract. The former Dunn home in Poplar Neck near Old St. Paul's Church was restored by pioneer aviator and aircraft builder Glenn L. Martin back in the 1940s. Mr. Martin's former farm caretaker, Carl Plummer, was my beekeeping neighbor; he left me his hives when he passed away late last year. Broadnox is currently owned by the DuPont Corporation and the farm goes by the name Chesapeake Farms.

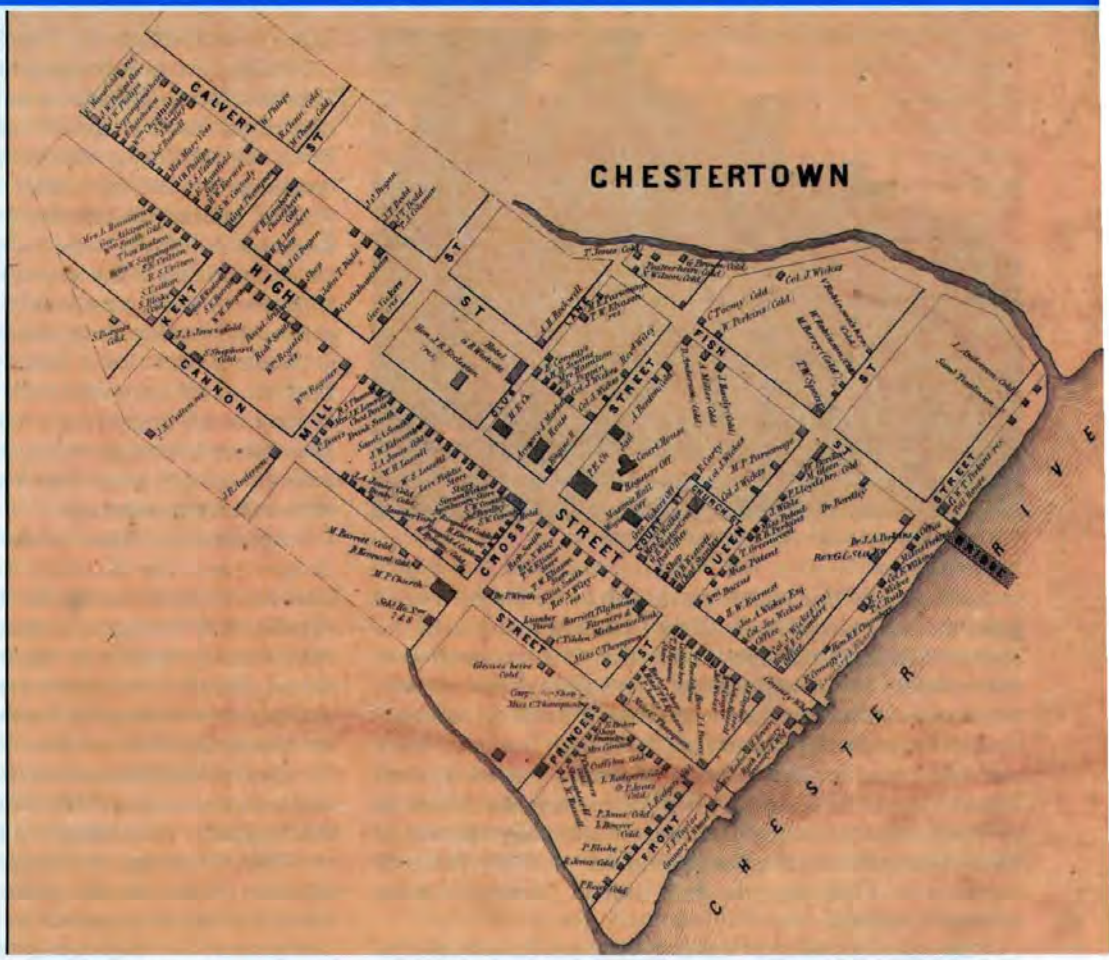
Langstroth's mother, Rebecca Dunn, was born at *Mulberry Plains* which at that time was by Hill's Cove on the northeast fork of Langford Creek in Kent County. In terms of present day geographical terms her birthplace is located at Beck's Landing in Broadneck. By coincidence, my brother Tim Redman currently tills the farm with the help of my father Theodore (who will turn ninety this year). My father says that there are still lots of mulberry trees growing down along the creek edge. The current home owner is a company CEO who spends time at the residence in Summer. The place is apparently completely restored. A write-up on Beck's Landing by a local architectural historian indicates that only the central portion of the house dates to the time of the Dunn's occupancy.

Rebecca Dunn was born in 1783. Her parents were James Brown Dunn and the former Elizabeth Lorain, natives of Kent Co. At her father's death Rebecca became a slaveholder; she was the owner of Dinah. When Rebecca's brother, James Lorain Dunn, sold *Mulberry Plains* in 1809, he reserved from the sale of the property the family graveyard. Stones inscribed "Dunn" from that period apparently can still be found north of the house at Beck's Landing.

Reverand Langstroth's Dunn heritage is intertwined with some of Kent County's most extraordinarily powerful historical figures. His four-times great grandfather was Major Joseph Wickes of *Wickcliffe*, the Chief Justice of Kent County. He was the first recorded slaveholder in the county. With his partner Thomas Hynson, Major Wickes owned, in its entirety, the areal extent of Eastern Neck Island. The customs checkpoint for all vessels entering or leaving the Chester River was located at the tip of Wickes' property. Up until 1674, his home served as the courthouse. At his death, his inventory contained two pages devoted to a listing of his books, mostly titles of a religious nature. The house at *Wickcliffe* was demolished but the spot where it stood remains one of Kent Co.'s most valuable historical areas. As it is within the boundaries of the Eastern Neck Island Wildlife Refuge, the current owner of the *Wickcliffe* site is the National Park Service.

Another direct ancestor of Rev. Langstroth was Michael Miller who had the large patent *Arcadia.* The 1814 Battle of Caulk's Field was fought on ground that had been part of this tract. Michael sold to the vestry, of which he was a member, the ground for Old St. Paul's, the Episcopal Church in Sandy Bottom at the head of the west fork of Langford Creek. His grave marker, near the door of the church, has the following inscription: "Doner of this sacred churchyard."

Langstroth's mother and father were married in 1808.



Chestertown by Simon J. Martenet, 1860, Library of Congress.

How is it that Rebecca Dunn met John George Langstroth in Philadelphia? I don't have a ready answer to this question except that there is a note in a local family history that Rebecca's parents also had a home in Philadelphia in Old Town at the corner of Second and Gothic St. This house was known up until recently as the old William Penn Mansion. The city's historians were sure that the house had been the early seat of Penn; they even organized events where Penn's descendants would ceremoniously visit the home and have tea. When the house eventually fell into disrepair a man known as "Crazy" Freddy Coombs petitioned the city to buy the property. Freddy believed himself to be George Washington and walked around town striking poses for the ladies in his silk hose. When Freddy's offer to purchase the house was turned down he petitioned the U.S. Congress to take possession of the Washington Monument.

The city council eventually moved the central portion of the Penn Mansion to Fairmount Park where it stands today. As it turns out, later research has shown that William Penn could never have lived in the house because Penn was dead before it was erected. So, unwittingly, it seems that a portion of Langstroth's heritage is maintained at the City of Philadelphia's expense because of a mistaken attribution.

Langstroth's maternal grandmother was apparently left a wealthy woman upon the death of her husband. According to a letter written by her niece, Elizabeth Dunn was also a beautiful woman. There is an entry in artist Charles Willson Peale's Journal about calling on his long-time acquaintance Mrs. Dunn and the editor's note that Peale was likely referring to Langstroth's grandmother. But Peale clearly explains that he was visiting the former Miss Callahan. There *is* a family connection, however, because Rebecca Langstroth's sister Anna married James Peale Jr., son of the less-famous brother of Charles Peale. Anna Peale died in childbirth.

Langstroth himself, in his Reminiscences series of articles for *Gleanings in Bee Culture* magazine, explains that his grandmother taught her slaves to read and write and eventually freed them. She married second a Kent County native by the name of Gideon Comegys. The Comegys family had a Quaker background and Gideon and one of his brothers had been ostracized in their revolutionary

Redue House, Chestertown, Kent County, Maryland.

Lorain house on High Street in Chestertown.

youth for neglecting meetings, as well as for toting around guns and learning the art of war. Gideon was one of the sons of Edward Comegys II and Mary Thraul. They were the builders of *Comegys Bight* – this impressive plantation house still stands today in Quaker Neck. At one time the Comegys family would have held high rank and have had few peers for the number of slaves owned in Kent County. Both Langstroth biographer Florence Naile, as well as Langstroth himself, fail to mention that the widow Elizabeth Dunn married a slaveholder in 1789. The U.S. Census for 1790 records that Gideon Comegys had a total of 13 slaves.

Langstroth's mother used to visit her sister Emeline Comegys at the latter's home on Front St., which is now Water St., next to the Customs House. Emeline married Joseph Redue who was present at the Battle of Caulk's Field in 1814, where the local militia was successful in a skirmish against the British. Redue was a merchant, prominent in the affairs of Chestertown. Redue House, was torn down in the 1920s to build apartment houses.

Langstroth's grandmother Elizabeth died in 1823 and is buried in the Christ I.U. Churchyard near Worton. Elizabeth was the daughter of a British born sea captain named Thomas Lorain and a Kent County woman, the former Mary McKenney. Thomas and Mary Lorain also had two sons born at Chestertown. Thomas Lorain, the younger, was a merchant who moved to Petersburg, Virginia and was reputedly ruined when an uninsured cargo vessel that he was backing with a business partner sank in the ocean several leagues from the mouth of the Chesapeake.

The other son, John, moved to Germantown after the death of his first wife Martha Tilden. She was described, in a letter written by her niece, as a proud but kind woman. Martha was the daughter of Marmaduke Tilden II and his second wife Sarah of *Great Oak Manor* in Kent. While living at Germantown, John Lorain maintained a farm, kept a store in Philadelphia, and wrote innovative and practical essays on agricultural topics. He was one of the first to understand and describe the underpinnings of corn hybridization; he even foresaw that increased yields would lead to a prosperous midwestern Corn Belt. At the time of his death in the 1820s, John Lorain lived in a log cabin near Philipsburg, Centre County, Pennsylvania.

Naile, in her biography, suggests that Captain Thomas Lorain was the son of Count Louis Lorraine, a disenfranchised Hugenot refugee who fled to England. Even one of the granddaughters of Thomas Lorain's recalls in a letter that other members of the family said that he was a full-blooded Frenchman, though born in England. Attempts to follow up on this information have yielded nothing in the way of confimation. Another writer, with ties to the Lorain family, suggests that Thomas had a Norman background dating back to the time of the invasion period. Rear Admiral Sir Lambton Lorain, an English naval hero who took a stand at Santiago, Cuba, to save some imprisoned countrymen as well as a few Americans from execution, as well offers speculation in a family history book that Thomas Lorain was a relative with a Norman heritage.

Apparently, there were Lorain estates in Durham County near the Scottish borderland in England that were established during the time of the conquering by the French. This is the same area that the Calverts, founders of provincial Maryland, hailed from. This interpretation seems plausible but there are few facts to support either the Huguenot theory or the Norman theory to account for the background of mariner Thomas Lorain.

Captain Lorain apparently obtained letters of marque and took command of the British ship *Viper* out of Kingston, Jamaica. According to a Boston newsletter that dates to 1759, Thomas, in charge of the *Viper* and another captain, master of the *Drake*, chased after a well-armed French sloop to intervene as it tried to capture a cargo-laden scow belonging to the planters in the Port Maurant area of Guyana. They were reportedly greatly satisfied when their valued, "good-going" vessel returned safely with cargo intact.

Thomas was the captain and owner of a 37-ton square stern schooner called *Three Brothers*. This boat was built in Nova Scotia in 1764 and registered at Patuxent. The boat was cleared outbound from the Port of Annapolis in 1768 with a package of 39 hogsheads of rum. Needless to say, that's a lot of yo ho ho. Thomas seems to have enjoyed satirical verse as he is listed, along with other colonial American subscribers, in a 1768 volume of Charles Churchill's poems, published in London.

One of Thomas' granddaughters writes a touching account of the Captain's death on the island of St. Kitts with the nearly-obligatory account, for the better sort of post-bellum Southern white families, of the faithful slave. Cotton, the slave carried back his master's personal belongings and nothing was amiss. As a reward for his unwaivering fidelity Cotton was given his freedom. Thomas Lorain's will was proved in 1771 in Kent County.

Thomas and Mary Lorain lived in a house in Chestertown, built about 1765, on property purchased from the Wilmer family. Their dwelling, known today as Lorain House, stands on Lot No. 7, High Street – just a short walk up from the Chester River waterfront.

Not long after the death of her husband, Langstroth's great grandmother Mary Lorain ran into a problem with laborer Moses Graves. According to the Kent County Court records, Moses was charged with stealing a 10-penny bill from Mary in August of 1771. As a result he had to stand in the pillory for 10 minutes, receive 39 lashes, and pay

Mary back four-fold the value of the stolen note.

Mary (McKenney) Lorain married second James McClean, a planter, of Sterling Castle and had three children: Anna Maria, Margaret, and William. James had been previously married to Frances Lewis and there were five children from that union. So Mary presided over a household that sorted out as "yours, mine, and ours." Mary's nephew, Thomas Lorrain McKenney, who attended school in Chestertown, was an intimate of President Madison and his wife. Under Andrew Jackson, Thomas was appointed as the first Superintendent of Indian Affairs and, in spite of his merits as a leader soon came under fire. His brother, Rev. William McKenney, was one of the first Navy Chaplains and an agent for promoting the establishment of the country of Liberia. The Chestertown families of Bolton, Dunn, Brooks, Findlay, Monk, Storey, Ingram, McClean, Anderson, and McKenney, among others, were associated with the Lorain family by mutual kinship and partnership.

Mary McKenney Lorain McClean died the month before her great grandson Lorenzo Langstroth was born. She is buried with her daughter Elizabeth at Christ I.U. Cemetery which, along with the old church, is on the National Historic Register. When actress Katherine Hepburn died she set aside a modest sum of money for the exclusive use of the church; her grandfather, Sewell Hepburn, had been a minister there.

The roots of the McKenney family are in the Scottish Highlands; the progenitor in America was named Macom Macenne or Mhaol Challium Maccoineach (1637 – 1665). Malcolm was the grandson of Kenneth, known as Lord Mackenzie of Kintail, and his second wife Isabel, daughter of Sir Gilbert Ogilvie of Powrie. At age 14, Malcolm went off with his father to fight in the Battle of Worcester which took place on 3 September 1651. This was the decisive final battle of the English Civil War. Oliver Cromwell and the Parliamentarians defeated the Royalist, predominantly Scottish, forces of King Charles II at Worcester. The 16,000 Royalist forces were overwhelmed by the army of Cromwell, 28,000 strong. Afterward, Charles II, with a price on his head, barely managed to escape. About 3,000 men were killed during the battle and a further 10,000 were taken prisoner at Worcester or soon afterward. Around 8,000 Scottish prisoners were deported to New England, Bermuda and the West Indies to work for landowners as indentured laborers. Malcolm and his father were captured on the battlefield and marched to London where they were imprisoned. Malcolm's father was soon released by the Parliamentarians and returned to the Highlands. Seven days after the battle, the council of the Estates banished Malcolm to the colonies to serve for seven years. Before the month of September was over Malcolm was one of among 1,610 Royalist prisoners, captured on the battlefield of Worcester, who were sent by a fleet of ships across the Atlantic. Most of the war prisoners were sold to planters in Barbadoes. Subsequently, the flagship of the flotilla was lost at sea – along with its commanders. Six harrowing months after leaving England, the few remaining prisoners who yet survived were delivered to Jamestown. Here, Malcolm McKenney was bound to a Quaker from Accomac County, on the Eastern Shore of Virginia, for seven years of service.

Malcolm's time of servitude passed benignly and in 1659, a free man, he went northward to Kent Island where he joined a troop of soldiers quartered at the fort established at Crayford. This company, under the command of none other than the infamous Captain Thomas Broadnox, marched to the head of the bay to contain the Susquehannock Indians, which, from the English point-of-view, were causing trouble. The ravages of smallpox spread among the native American populace so swiftly that by 1662 the troops stationed at Crayford disbanded.

Completion of his term of servitude entitled Malcolm to 50 acres of land; thus he became a small planter at Piney Neck on Kent Island –along the Chester River's edge between modern day Stevensville and Chester. After taking up his parcel, the area historically referred to as "Great Thicket" came to be known as Macom's Creek. Three hundred and 50 years later, the name still holds. In other words, Langstroth's three-times-great grandfather has a river tributary named after him on the largest island in Chesapeake Bay which is the site of the first European settlement in what is now Maryland.

In 1663, Malcolm and Annika, the widow of first Anders Hanson and second Andrew Ellinor, were married. Annika, apparently born in Sweden in 1619, had been Malcolm McKenney's neighbor on Kent Island. When she joined him at Piney Neck the household included four of the six children from her previous marriages; interestingly, Annika's son Hans Hanson had been indentured to another Langstroth ancestor, Col. Joseph Wickes, who agreed to feed, clothe, and educate Hans until he came of age.

In 1664, a son named John was born to Malcolm and Annika. Not yet 30 years of age, Malcolm McKenney died on Christmas Eve in 1665. By July of 1666, Annika had given birth to Malcolm's posthumous son William McKenney, Rev. Langstroth's two-times-great grandfather. By that time Annika McKenney had married John Dobb, her fourth husband and moved to Barnstable Hill on Kent Island. Annika Dobb died in 1670 and her orphaned McKenney children went to live with their brother Hans Hanson who was by this time living at Kimbolton at Piney Neck on Langford Creek in Kent Co. At the time of his death in 1740, William McKenney, son of Annika and Malcolm, was living on High St. in Chestertown. This house stands directly across from Lorain House.

The extent of our knowledge of the family history of Rev. L. L. Langstroth has been extended considerably since the biographical account by Naile in the 1940s, thanks to the diligent efforts of Marc Hoffman and others. While Langstroth's Lorain ancestors are reputed to have a French background, and this would indeed seem to be the case whether Huguenot or Norman, the details are so far unconfirmed. We do know for certain that the lineage of Rev. Langstroth includes Swedish and Scottish roots that were previously unexplored. The Scottish heritage of Langstroth has been well-documented by the late John and Maria McKenney, who traced the emergent growth of their family from a warrior clan flourishing at the time of Robert the Bruce. There is royalty in Langstroth's English background as Malcolm McKenney's great great grandmother, Elizabeth Stewart, was of Plantagenet stock. BC

Matt Redman is a vendor of honey and handcrafted soap products at the Easton Farmers Market in Talbot County, MD.

Calculating Growth

Measuring A Stable Population

How many bees are in that box? It pays to know. Here's a start.

J. Lloyd Harris

Introduction: Beekeepers know that a honey bee colony's population grows during the Spring and Summer and declines during the Autumn (Harris, 2008). The primary reason that this is so is because it's during the Spring and Summer flowering plants bloom and provide the pollen and nectar that the bees need to rear brood. When colonies rear enough brood, they tend to become more populous.

But just how many bees does a colony have to rear in order for its population to increase in size and why should you care?

Why should you care? Every beekeeper should care about the amount of brood being reared by their colonies, because this is the "engine" that drives colony growth. It determines if a colony's population will be large enough to adequately pollinate a crop and just how much honey a colony is capable of harvesting. The colony's brood production rate can also be used to assess management practices like: the effect that queen excluders have on swarming, a colony's response to pollen supplements, or the impact of restricting brood production in the Fall has on the size of the Winter colony. Knowing how, when and why brood production should be regulated makes you a better beekeeper.

Exactly how many bees need to be reared? The answer to this one is that it depends. It depends on how many bees from the colony die every day, which in turn depends on how many bees there are in the colony. The colony's size determines how many bees die every day. The number of bees a colony contains also depends on the amount of brood that a colony can successfully rear to become adults, which in turn depends on how many bees there are in the colony. Sounds like a circular argument, but really it is not.

The changes in a colony's population are just simple math. Just subtract the number of adult bees added to the population through brood rearing from the number of adult bees that die every day. Seems simple enough, but the difference between these two variables determines whether a colony's population increases or decreases. If the number is a positive number, the colony is getting bigger. If the number is negative, the colony is getting smaller.

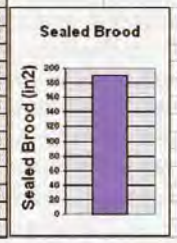
But how many bees is that exactly? The short answer is that it depends on how many bees there are in your colony. The larger the colony is, the more bees there are that die every day and the more bees that will need to be reared to replace them.

In years past, these calculations could take days to perform. Now they can be preformed by almost anyone with access to a computer and simple spreadsheet software. The following provides an easy guide for performing these calculations.

Methods: The spreadsheet used to perform these calculations used the honey bee population model logic developed by Harris (1985). This population model treated the colony as being composed of two separate groups of bees. The first group was the worker population at the beginning of the experiment. The second group of bees was the bees reared by the colony after the experiment began. Both groups of bees were composed of sub-populations of bees belonging to different age classes.

The initial population of worker bees can be estimated from the odds ratio of the weight the colony's populations and the weight of a known number of bees. Subsequent

	A	B	C	D	E	F	G	H	I	J	K
1	Date	Initial Colony	Sealed Brood (in²)	Sealed cells / day	Target Colony	Adults / day	Adults /day/1000				
2	04-Mar-10	8000	190.00	439	15,185	434	28.6				
3											
4											
5	Worker Bee Survival at 12 Day Intervals (%)										
6	t_0	t_{12}	t_{24}	t_{36}	t_{48}	t_{60}	t_{72}	t_{84}	t_x	Average	
7	100	95.24	75.06	48.91	21.3	5.15	0.54	0.03	0	35.52	
8											
9	Date	04-Mar-10	16-Mar-10	28-Mar-10	09-Apr-10	21-Apr-10	03-May-10	15-May-10	27-May-10	08-Jun-10	20-Jun-10
10	Sealed Brood	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00
11	Initial colony	8000	5576	3340	1589	525	104	10.0	1	0	0
12	New colony		5085	9415	12567	14352	15025	15169	15184	15185	15185
13	Total workers	8,000	5,085	9,415	12,567	14,352	15,025	15,169	15,184	15,185	15,185



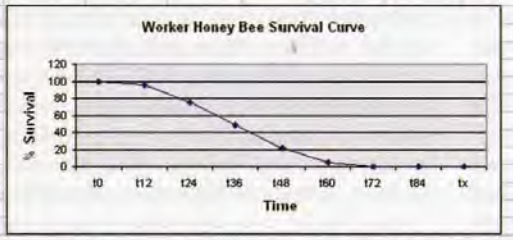


Figure 1. *General format of spreadsheet workbook used to calculate sealed brood production needed to maintain a stable honey bee population.*

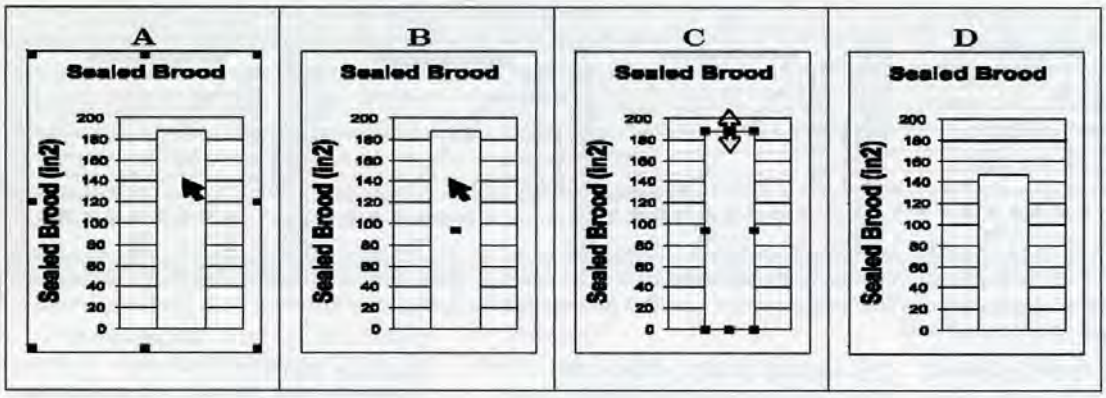


Figure 2. *Appearance of graph as it is selected for modification using the Graphical Goal Seeking feature in the spreadsheet software.*

estimates of the size of the initiating colony can be determined from the survivorship of marked worker bees introduced into the colony when the experiment began. The initial population can also be estimated using the same techniques used to estimate the bees reared by the colony, but this requires an understanding of how the parent colony had been developing and how these adults will die.

The colony's developing population was estimated from seasonal sealed brood estimates taken at regular 12-day segments throughout the Summer. Each 12-day sealed brood segment was treated as a unique sub-population. The demise of each sub-population was estimated either from marked worker bees introduced into the colony when the sealed brood was measured or from a standardized honey bee life table. The colony's adult population was then calculated by adding the estimated proportion of each sub-population alive on specific dates.

The Harris Population Model procedure has recently been converted from a computer program written in Fortran to a spreadsheet application (Harris & Harris, unpublished). The basic spreadsheet can be uploaded from the Department of Entomology, University of Manitoba website.* The following describes how to use the spreadsheet to perform the necessary calculations.

Spreadsheet Example: The simplified worksheet is contained on the spreadsheet's workbook tab called "Colony Equilibrium." It contains all the information you need to calculate/determine what the daily worker bee emergence rate must be to maintain the colony at a specified equilibrium.

To perform these calculations the spreadsheet requires information about: 1) the experiment's starting date (Cell A2), 2) the initial size of the colony (Cell B2), 3) a brood area estimate (CellC2), and 4) a series of worker bee survival estimates (Cells A7:i7) (see Figure 1 previous page).

The yellow highlighted cells contain these estimates. The data in the yellow highlighted cells in the Colony Equilibrium workbook are subsequently transferred into two other workbooks in the spreadsheet (to be discussed further in Part 2). The results of these calculations are transferred back into the Colony Equilibrium workbook as pasted links. Changing the values in the yellow highlighted cells immediately recalculates the population estimates displayed in the Colony Equilibrium workbook.

The contents of the yellow highlighted cells may be changed by entering different values into these cells using the computer's key board or by using the Graphical Goal Seeking Feature of the software discussed below (not available in Excel 2007).

The worker bee survival estimates shown in Row 7 of Table 1 can be replaced with data from any standard life table (Saskagami & Fukuda, 1968) or from direct observation of a marked cohort of bees. These worker honey bee survival estimates must be for regular 12-day intervals beginning with when the worker bee cohort first emerged.

The orange colored cell (E2) contains an estimate of the size of the colony that is produced if the colony were to consistently produce the amount of sealed brood contained in Cell C2. The orange highlighted cell contains a reference to another workbook and should not be altered except with the Goal Seek feature located on the software's Tools menu or by altering the data in the yellow highlighted cells.

The grayed-out cells also contain formulae or references to other workbooks and should not be altered. The spreadsheet example already contains the default values that are necessary to calculate the amount of sealed brood necessary to calculate the number of bees that must be added to the population to maintain its population at 15,000 bees.

The following provides some instructions for beekeeper's that are unfamiliar with the spreadsheet software's Graphical Goal Seeking features and the Goal Seek option on the Tool menu. If you are already familiar with these spreadsheet features, proceed directly to the Results Section of the article.

Graphical Goal Seeking. The graphical goal seeking feature in the software is used to visually alter spreadsheet data that has been presented in graphical format by adjusting the graphical representation of the data, which in turn changes the data in the related cells in the spreadsheet.

To use the graphical goal seeking feature of the software, place the cursor directly over the bar within the graph/chart (Figure 2A) and left click the mouse to select the bar graph. Do not double-click the bar on the graph/chart unless you want to change the related information in the Format Data Series dialogue box.

If a bar graph has been selected, the selected bar will display a square at its centre to show that the bar has been selected (Figure 2B). Once the bar has been selected, left click the bar again and the graph will display "handles" around the bar (Figure 2C). When the cursor is placed over

*http://www.umanitoba.ca/afs/entomology/links.html and selecting and saving "Honey Bee Colony Equilibrium Estimation Procedures".

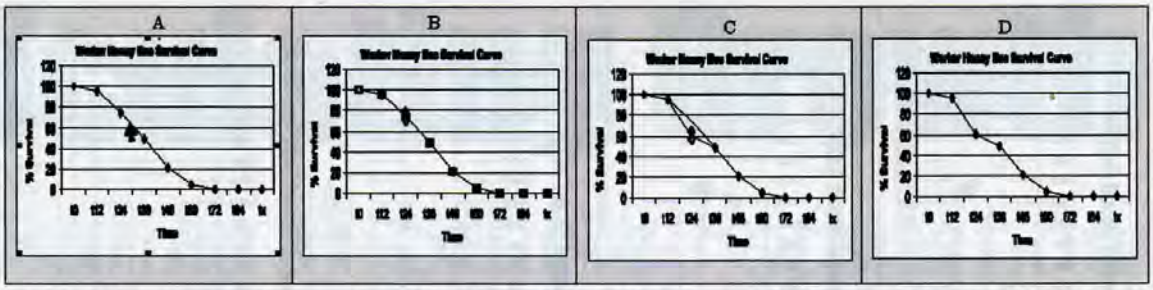


Figure 3. *Appearance of line graph as it is selected for modification using the Graphical Goal Seeking feature in the spreadsheet software.*

the top centre handle, the cursor will change to a double-headed arrow (Figure 2C). Depressing and holding down the left mouse button will select the bar and allow the user to alter the data associated with the graph by dragging the bar up or down. When the left mouse button is released (Figure 2D) a new value is saved into the associated spreadsheet cell, CellC2.

If the graph contains a line with nodes, place the cursor over the line (Figure 3A) and left click the mouse to select the line. The nodes on the line will be highlighted (Figure 3B). Then place the mouse over the line node that you want to alter and left click that node.

A double-headed arrow will appear over the selected line node. When the left mouse button is depressed and held, the line node can be dragged up or down. Releasing the mouse button enters a new value for the point in the associated spreadsheet (Row 7).

Row 9 through Row 13 on the Colony Equilibrium workbook tab contains the colony population estimates and the dates that these populations were attained. These colony estimates can also be graphed using the software's graphing features.

Goal Seek: The computer can also preform the spreadsheet calculations for you by using the "Goal Seek" feature off of the Tools menu on the main menu's tool bar. To use this option place the cursor over the orange cell (Cell E2) and select the cell by left clicking the mouse. Next select the Goal seek option from the Tools menu off of the main menu's task bar. When this option is selected a dialog box is displayed that asks you to select/set the cell you want to change (i.e. Cell F2), the value you wish that cell to contain after it has been changed (i.e. 15,000 or some other estimate) and the cell you want to change so that the result you want can be achieved (i.e. sealed brood in Cell C2).

Results: The spreadsheet allows the user to calculate the square inches of sealed brood that a colony would have to produce during successive 12-day periods during the Summer (Cell C2) and the number of new workers that must be added to the population every day for a colony's population to remain constant at a specified level (Cell E2). Colony population stability cannot be achieved instantaneously because the initiating colony was not a stable population of 15,000 bees. Although the population differences are small a truly theoretically stable population cannot be achieved until all the bees in the initiating colony have died.

For example, in order for a colony that starts the season with 15000 bees to remain at this level during the Summer, a colony would have to have 187.69 square inches of sealed brood throughout the entire Summer. This is just slightly more than one complete side of a standard Langstroth frame (132.8 in^2/side). A better comparison would be a frame with 95 square inches of brood on both sides of a single frame because bees seldom use all the cells on a frame for brood.

If this colony had fewer worker bees being produced, its population would decline. If it had more bees produced, its population would increase. Under these conditions, this colony would have to produce 429 new bees every day (Cell G2) just to replace the 429 bees that die every day. For every thousand bees in this colony, it would have to rear 28.6 new adult bees (Cell G2) in the colony, every day, all Summer long just to maintain its population. The estimated number of bees required to maintain the colony's population at stability would be even higher if the average worker longevity was less than the default values of 35.52 days provided for this example (Cell J7).

If the average longevity for the worker bees was reduced to 26 days as has been reported from observations on colonies in Georgia (Rueppell, et al. 2007), this hypothetical colony would have to produce 540 new bees per day or the equivalent of 36 new bees per day per thousand bees in the colony.

Discussion: The material presented in this paper is a simplified version of the Harris Honey Bee Population Model and an example of how it can be used to provide insight into colony development. The model calculates a colony's population by estimating the number of bees being added to the colony's population through "birth" and the number of bees subtracted from the colony's population because of death.

This example used a constant sealed brood rearing rate, which almost never occurs in a honey bee colony. In a real colony, the sealed brood produced by the colony fluctuates every day based on the initial colony's size, the availability of food, disease and parasites, and local weather conditions. etc.

This example also uses an average survival rate for workers bees obtained from mite free colonies in Manitoba Canada. This average worker bee survival curve was applied to all subpopulations throughout the entire Spring and Summer. In a real colony the worker bee survival may vary throughout the Summer depending on when the bees emerged (Free & Spencer-Booth, 1968; Fukuda and Seckiguchi, 1966). The single survivorship curve was used for its simplicity but the spreadsheet presented can be modified to accommodate a separate survivorship curve for every sub-population of worker bees.

There is an indication in the published literature (Rueppell et al.) that worker bee survival rates in

some parts of the United States may have a substantially lower average life expectancy during the Summer. The survival estimates should be replaced with local worker bee survival data if they are available. The lower the average worker bee life expectancy, the higher the colony's reproductive rate will have to be just to maintain the population at equilibrium.

Conclusions: A honey bee colony needs to produce between 28 to 36 new bees per day *per thousand bees* in the colony during the summer *just to maintain* its population. This means that a colony with 50,000 bees must produce at least 1429 new adult worker bees every day or its population will decline. Substantially more worker bees will need to be produced in colony where the worker longevity is less than 35.5 days. BC

Part 2, Measuring Population growth and decline will be in the August issue.

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Managed Pollinator CAP
Coordinated Agricultural Project

Breeding Bees For Resistance To Parasites and Diseases

Greg Hunt

Those of you who have been keeping bees for over 20 years remember a time when bees pretty much took care of themselves and we expected Winter-kill to be low. But ever since mites were found in the U.S. in the 1980s, we expect to lose 25% or more of our hives each Winter and we need to think about controlling the mites. Recent surveys indicate that the biggest impact on colony losses can still be traced to the presence of *Varroa* mites and the diseases associated with them (Currie et al. 2010; Dahle 2010; Guzmán-Novoa et al. 2010; Peterson et al. 2010). In the Winter of 95-96, we lost more than half of the colonies in Indiana, primarily because of *Varroa* (Hunt 1998). A recent study even suggested *Varroa* may have been a major factor in "colony collapse disorder" or CCD (vanEngelsdorp et al. 2009). A sustainable solution to this problem would be to breed for bees that can better tolerate *Varroa* and are resistant to diseases. Efforts for breeding for resistance are now getting a boost from the USDA-CAP honey bee health project. Here is an update on what we are doing.

Dysentery disease. A few years ago, researchers used DNA sequencing of bees with symptoms of CCD and made the unexpected discovery that *Nosema ceranae* was present in the U.S. This parasite is related to *Nosema apis*, which causes dysentery. We now know that *N. ceranae* has been here for more than a decade (Chen et al. 2008). It is not clear what the impact of this new *Nosema* has been but we do know that bees often have extremely high spore loads of *N. ceranae* in their guts, even in the Summer time. My graduate student Gladys Andino has done some preliminary inoculations of bees in cages to look for variation in resistance to *Nosema*. These cage tests involved emerging bees in an incubator, marking them with paint so that we know what colony they come from, and feeding them spores in sugar syrup. Figure 1 shows that there was variability between colonies for the impact of *Nosema* on survival, suggesting it may be possible to breed for resistance. We are expanding the screening this year to see how repeatable these results are.

Viruses. There has been a lot of recent research on honey bee viruses, but since viral infections require expensive molecular techniques to analyze, it is difficult to know which viruses are causing the most widespread problems because viral infections usually go undetected. It is known that *Varroa* can transmit viruses and weaken the bee's immune system. There is also evidence that some viruses can be transmitted to the egg from infected queens (Chen and Siede 2007; Aubert et al. 2007). Surveys have begun for viruses in the CAP stationary apiaries that were set up across the country. These surveys have shown that many bees have viruses but show no symptoms. Deformed Wing Virus (DWV) was the most prevalent in initial screens (see earlier article by Spivak). DWV is one of the viruses that are often associated with *Varroa*. We took a look at bees in the Purdue apiaries last year because mite populations were quite high and some colonies began to dwindle in the Fall. We rarely treat our bees to control mites and there were no breaks in the brood cycle to reduce mite levels last year. A student in my lab, Alicia Kelley, looked at both dwindling and healthy-

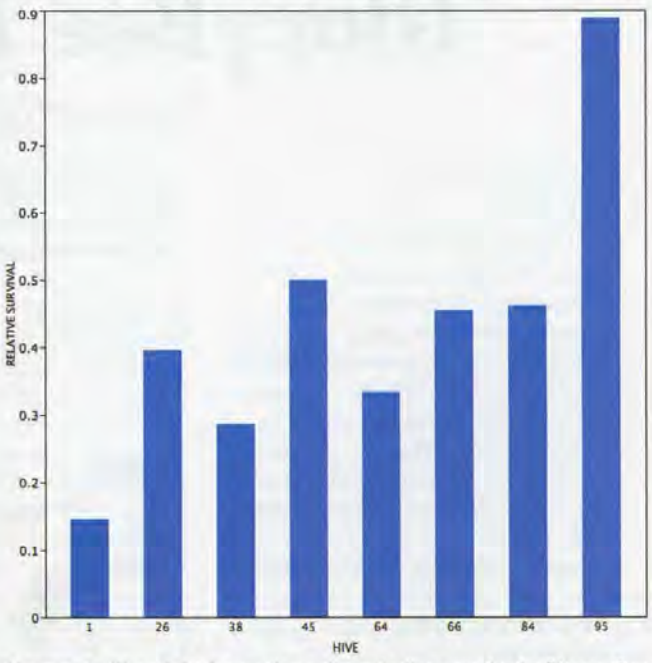

Figure 1. *The eight bars show the relative survival of bees that were collected from eight hives and kept in cages. Eighty bees from each hive were marked with paint and kept together in cages. Control cages were just fed sugar syrup, other cages were fed 150,000 spores of* N. ceranae *per bee. The relative survival is the survival of spore-fed bees divided by the survival of bees that were not fed spores.*

looking colonies and analyzed for *Nosema ceranae* and six viruses. She found that all of the 38 hives we sampled had deformed wing virus. Sick colonies were a little more likely to have *Nosema*. Acute Bee Paralysis Virus was strongly associated with both sick hives and colonies that died. Deformed Wing Virus levels were also higher in colonies that were co-infected with acute bee paralysis virus (Figure 2). There may be an opportunity to select for resistance to virus. It seems that the only studies that involved selecting bees for resistance to a virus come from Walter Rothenbuhler's lab 35 years ago – the same gur-esearcher who first bred bees for hygienic behavior! They found it was possible to select for increased survival of caged bees that were inoculated with the virus that causes hairless black syndrome (Kulincevic and Rothenbuhler 1975). It seems high time we started looking at resistance to viruses, so we plan to collaborate with Judy Chen, a virologist at the Beltsville USDA Bee Lab to try to screen for resistance to Acute Bee Paralysis Virus.

Mites. It seems that sufficient resistance to tracheal mites now exists in many bee populations, so let's focus on *Varroa* mites. One method that beekeepers use to select for resistance to *Varroa* is just to let their hives go untreated and breed from survivors. This has shown some success but may not be the most efficient way. Another method is to import survivors like the Russian bees that the Baton Rouge USDA bee lab brought from far eastern Russia. A third way is to select for specific traits that have been found to confer some resistance towards *Varroa*. Several USDA and university breeding projects have taken this approach. The Minnesota hygienic lines were developed by Marla Spivak and colleagues, and were shown to have significantly lower mite populations in field studies. The two most important traits for mite resistance appear to be *Varroa*-sensitive hygiene (VSH) and grooming behavior. Bees with high VSH detect the mites in the cells and uncap those cells, which disrupts mite reproduction. Other bees have been shown to groom mites off of themselves and to bite the mites. At Purdue we have been selecting for bees that have lower mite population growth for years and in the past few years we have been focusing more on grooming behavior. Last year, we used CAP funding to develop a new method for assaying grooming behavior. The usual method involves taking mites that fell from colonies and mounting them upside down on microscope slides to see how many have been chewed by the bees. This method is enough to drive even the most patient grad student a little nuts! My student Gladys Andino now uses a method that involves collecting bees in frame cages and seeing what proportion of the mites the bees remove during a three-day period. She found that the proportion of mites removed correlated with the proportion of mites that were chewed in the colonies that the bees were taken from (Figure 3). This method was presented at the American Bee Research Conference, held in conjunction with the American Beekeeping Federation meeting in Orlando, FL, January 14-15 and a video of her talk will be posted on the honey bee health website (http://www.extension.org/bee_health).

The genetics of resistance. It is possible to make crosses between honey bees that represent high and low lines for a specific trait and to then use DNA markers to follow the inheritance of gene regions that influence the trait. In the honey bee, this technique was first used to map genes influencing behavioral traits like pollen foraging and stinging behaviors and eventually led to the identification of candidate genes (Hunt et al. 2007). This technique of "quantitative trait locus" or QTL mapping has also been used to map genes that influence general hygienic behavior (Oxley et al. 2010). The limitation of these methods is that there often are many candidate genes identified and we are still not sure which are the right genes. But if we can find the right genes, maybe we could use DNA markers in the genes or near the genes for marker-assisted selection. Then we could test to see if bees have the right versions of genes for resistance. Marker-assisted selection might speed up the process of breeding for resistance and allow us to incorporate several different resistance traits in the same breeding lines.

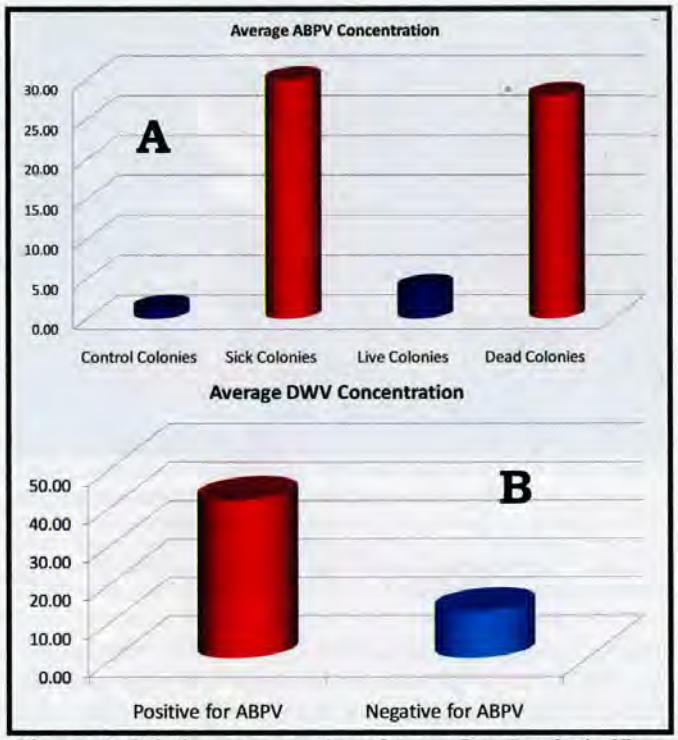

Figure 2. *Relative concentration of Acute Bee Paralysis Virus and Deformed Wing Virus in bees.* ***A.*** *Colonies that appeared sick in the Fall because the population dwindled and colonies that died during the Winter had higher ABPV levels in the Fall.* ***B.*** *Colonies that had more ABPV also had more DWV.*

Funding from the USDA-CAP and another USDA grant are being used to map genes that influence VSH and also genes that influence mite-grooming behavior. Jeff Harris of the USDA Baton Rouge Bee Lab has already done the single-drone crosses and analyses of VSH behavior needed for this gene mapping, and my colleague Miguel Arechavaleta-Velasco has done the same for grooming behavior. We will use Jeff's data to compare bees that showed VSH behavior to their sisters that did not perform the behavior. For grooming, Miguel actually measured how long it took for a bee to react when he put a mite on its back. These analyses were done in a single family of worker bees that are daughters of a hybrid queen backcrossed to one of the two parents. In each bee, the DNA markers are inherited along with one of the two versions of each gene (high or low) from their mother. We plan to use a high-tech genotyping system for the mapping.

Fiture 3A. *Frame cages used for assaying grooming behavior. The tops and bottoms have screen. Mites fall out the bottom onto sticky sheets in the lab and are counted. After three days, mites are also removed from adult bees with powdered sugar and counted. The proportin of mites that drop is calculated as a measure of grooming behavior.*

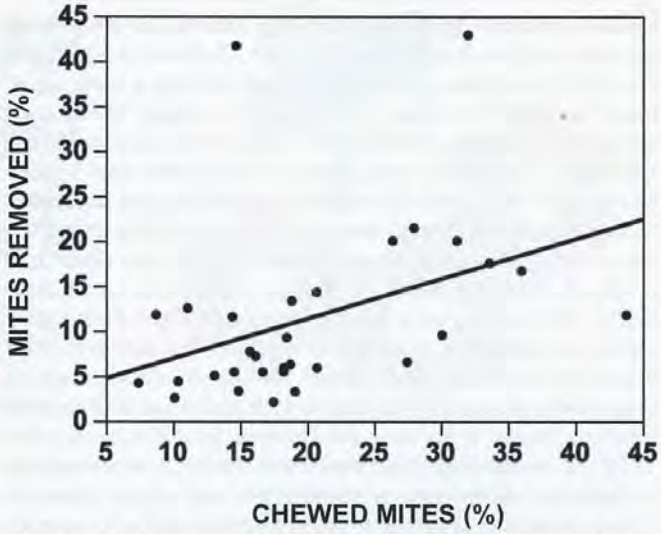

Figure 3B. *The grooming assay works. The proportion of mites removed in cages correlated with the proportion of chewed mites on sticky boards taken from beneath the hives that we collected bees from.*

The backcross workers will be analyzed for 1,500 single-nucleotide DNA differences (between the high and low parental lines) to determine whether a gene region came from the high or the low line. Then we will compare the presence of DNA markers from the high-VSH parent or high-grooming parent with the behavior of each individual bee to associate genes with the behavior. We think this mapping will be at much higher resolution than previous work done in bees. We would like to also extend the QTL technique to try to find genes for resistance to disease, but first we need to identify resistant and susceptible strains.

Selection for any trait is always a work in progress. Breeding is a slow, laborious process and once you stop selecting for a trait, you start losing it. Breeding programs do not provide a lot of publications for researchers, nor do they provide enough economic incentive for commercial queen breeders. Maybe this situation will change in the next few years as people become more aware of the value of helping bees to help themselves. Things that might accelerate breeding for resistance include good inoculation methods, better assays for the traits, understanding the important factors in disease progression, understanding the genetics, and methods for cryopreservation of honey bee semen or eggs. The recent funding from the government for bee research has put many of us researchers on a honey bee health kick, so more attention will be directed at these problems. BC

Greg Hunt is at Purdue University in Indiana.

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Plant Diversity Necessary

An overall decline in pollinators, and the plants they visit could very well make the United States more reliant on imported foods.

Yael Grauer

A January 2010 Biology Letters paper indicates that a decline in plant diversity could very well be causing a similar decline in bee populations. Honey bees that pollinate on a wider variety of plants have a more robust immune system than bees which pollinate on monocrops, even when the monocrops had higher protein content. Specifically, bees with a polyfloral diet containing a mixture of five different pollens had higher levels of glucose oxidase(GOX) than those fed a monofloral diet. Bees produce glucose oxidase to protect honey and food for larvae against microbe infestation. GOX is secreted into the larval food and honey, helping prevent infectious disease in colonies.

Scientists are not yet certain why pollinating on a variety of plants helps bees produce glucose oxidase, but it's been posited that a polyfloral diet helps increase the diversity of specific proteins and amino acids that are required for tissue development. It has also been theorized that a lack of variety of proteins makes honey bees more susceptible to disease because they need the synergistic action of various chemical defenses.

Many honey bee colonies suffer from malnutrition, which could be caused by immunodeficiency due to their diet. Many cities contain wider plant diversity in urban parks and gardens than rural areas, many of which contain large swaths of monoculture crops as the result of habitat destruction and the loss of biodiversity.

Records of declining bee populations have been examined side-by-side with records of declining wildflower populations as far back as 2006, with both declining in equal numbers in Britain and the Netherlands. Multiple bee species have gone extinct in both countries, and this has contributed to a decline in the abundance of insect pollinated plants. The health of both honey bees and wildflowers has therefore long since been thought to be intertwined, though many other factors (such as pesticides and climate change) may also come into play.

It is not just honey bees that suffer from a lack of plant diversity, but native bees as well. "From a larger ecosystem perspective, all bees whether honey bees or native bees need a succession of blooming plants throughout their growing season," said Eric Mader, National Pollinator Outreach Coordinator for the Xerces Society, a non-profit organization that protects wildlife through the conservation of invertebrates and their habitat. "In a lot of agricultural contexts, there is a really large monoculture of one blooming plant, like almonds in California or cranberries in Wisconsin, and in these really large cropping systems there tends to be sort of a deficiency of other blooming plants, or plants that are blooming when those crops are not in bloom." Native bees need plants to support their reproduction. "It's not even just an issue of immunity to diseases or parasites, but in order to provide them with food they need blooming plants throughout the growing season." What impact does a monoculture have on bumblebees? "The principal effects is just an absence of those pollinators in the landscape," Mader pointed out, "since there is no food to sustain them."

Biodiversity is not only necessary for bees but for human survival. Food-crop diversity and pollinating insects allow the agriculture to support our population. When disease strikes, plant diversity can preserve ecosystem integrity where fields of mono-crops are devastated. Greater biodiversity creates stability in other ways as well, as certain plants are less susceptible to weather disturbance and climate change. "Plants in a terrestrial ecosystem tend to form the base of the food web for everything else," said Mader. "Monocultures do not have the necessary nutritional base to support a wide range of different animals." An overall decline in pollinators could very well make the United States more reliant on imported foods.

U.S. agriculture is highly dependent on beekeepers, and if farmers diversify plant techniques, they could also use native bees to help pollinate particular crops in addition to providing the plant diversity necessary for a robust immune system. BC

Artificial SUPERSEDURE

"I have been artificially superseding my hives every July with success and without chemicals."

Mel Disselkoen

On July 24, 1908, G. M. Doolittle wrote,

"As this is the season of the year when the bees do most their superseding of queens (it seems so natural to them). My loss in using this plan will not average more than one queen cell out of 20 given." (*A Year's Work In An Out-Apiary*, 1908, A.I. Root Company, Medina, OH, page 75)

The concept of artificially superseding queens that would not make it through the Winter was presented by G. M. Doolittle in his book a hundred years ago. Today, artificial supersedure refers to increase, swarming, or cell building but it can also be used to refer to outbreeding mites so that colonies can successfully overwinter.

I discovered that the colonies that survived the Winter here in Michigan were the ones *that superseded their queens in July the previous year*, and not because the queens were genetically superior. These colonies survived because the mites were reduced to a minimum by the pause in brood rearing in the same way that Africanized bees survive the mite and increase via frequent swarming. After the break in brood rearing, when five-day-old larvae are again available for the fertile mite, all the mites instinctually enter the cells simultaneously and are then trapped when the cell is capped. The single larva isn't enough food for all the mites trapped within the cell and all perish. The bees respond hygienically by removing the carnage from the initial brood cycle. The Varroa population is greatly reduced by this unexpected biological assault to which it cannot become resistant. As if this weren't enough, the mites are further outnumbered by the bees when the newly-mated, prolific queens continue to outbreed them going into Winter.

Since I discovered this, I have been artificially superseding my hives every July with success and without chemicals. My bees benefit from not having to exist with the side effects of strong chemicals such as miticides. All northern colonies can be artificially superseded this way every July and those in the south every three to four months to naturally control the Varroa mite population.

And, you might ask, with what queens do I artificially supersede my hives? From where do I get my stock? The answer is that I rear my own, high-quality, never-been-shut-down queens by using a technique I now call On-The-Spot queen rearing, or OTS, as described on my website and historically documented in my booklet, *IMN System of Queen Rearing*, published in 1988 and now available at **www.mdasplitter.com**. For 25 years now, I have had the pleasure of watching my bees rear their own queens via this method which never ceases to produce wide, clean, abundant brood patterns at a rate that still astounds me. The vigor of these queens is remarkable and might be due to the fact that with OTS, there is never a pause in larval nutrition, the queen is not caged and shipped which shuts down egg laying, there is never a genetic clash between the queen and the hive within which she emerges, and, because the queens aren't lethargic from chemical side effects, they can take strong, long, mating flights as nature intended to obtain the greatest genetic advantage. How would you rate a good queen?

Over the years I have received many questions about my technique such as, Will OTS cause my bees to become aggressive over the long term and lose their easy-to-handle qualities? Will OTS produce an intercaste, or inferior-quality queen? My answer to these questions is that the proof is in the pudding. My queens perform with excellence and are of no cost to me. My hives overwinter successfully outdoors (above 90%). My bees are healthy and full of vigor. Dr. C.C. Miller experienced the same, successful results which he documented in his book, Fifty Years Among The Bees, and who, I ask you, has studied bees longer than Dr. C.C. Miller?

So here's the good news: We have the privilege and advantage of knowing that artificial supersedure can increase the survival of bees that are managed in the U.S. and throughout the world without the use of chemicals. And we as beekeepers have the option to utilize this knowledge. Thank you, G.M. Doolittle. Thank you, Dr. C.C. Miller. BC

Mel Disselkoen raises queens in Michigan. Learn more at ***www.mdasplitter.com.***

What Should I Plant For Me & For My Bees

Somewhere there is a perfect world

In my mind's eye, the sky is usually deep blue interrupted only by floating, white, fluffy clouds. In my mind-place, it does rain occasionally, but when it does, the rain is gentle and warm. The blue sky and the warm rain provide some of the fundamentals that my plants need to grow into lush, happy plants. In this perfect world, colorful wild flowers are always in bloom eagerly growing wherever I drop a few seeds. There are no weeds anywhere. Butterflies are drifting about and a blue bird is perched on the peak of my storage barn. My bees look great but in this world, they always look great.

Of course, this is not my real world – even though a warm, gentle rain is presently falling and there really was a bluebird perched on the peak of my storage barn yesterday. But I have trouble with the wildflower thing – unless you count dandelions and ground ivy as wildflowers. While it's not hopeless, my perfect world does need some work. Maybe I should plant more flowers.

Here's the rub . . .

I need flowers in my bee life – I need ***lots*** of flowers in my bee life. Almost daily, I talk about bees and flowers. I photograph bees on flowers. I discuss the relationship of bees and flowers to honey. While I deeply appreciate flowers, I am not an accomplished gardener – yet. I plan to be one day. Even now, right behind me as I write, I have a vintage 1974 Troy-Bilt "Big Red" Tiller. It needs work. I mean that is all I will need to be an expert gardener – right? Fire that machine up – rip up some grass and plant some flowers. That's my fundamental plan.

Pollen forager on Cornflower (Centaurea cyanus).

I literally talk to people every week who would keep bees, *"If they had more time."* So there I am. I would be a much better gardener *if I had more time.* While I have a farming/gardening background, I have never farmed nor been much of a gardener. So, here's the rub...while I am very comfortable discussing bees, I feel clumsy making specific recommendations for flowering plant selections for people who want to *"plant something for their bees."*

Here's the second rub . . .

For me, it is becoming increasingly difficult to recommend flowering plant selections for beekeeper use without knowing if the plants suggested are native, exotics or even invasive plant species. For instance, Cornflower *(Centaura cyanus)* is a great bee plant, but it is called Cornflower because it is sometimes a pest plant in English cornfields and is not native to the United States.

I have already discussed some of these issues in previous articles. The decision to plant selected hybrid varieties, wildflowers or native wildflowers is an individual one. Indeed, there are even different types of gardens. Some examples of theme gardens are: Cutting garden (produces fresh cut flowers), Pollinator garden (supports bees, butterflies, hummingbirds), Cottage garden (lush crowded garden with long, overlapping blooming varieties), Tropical garden (imported varieties frequently grown in water environments), Edible garden (in addition to common vegetables, colorful vegetables such as Swiss chard, ornamental kale and lettuce, and giant leeks) and long-blooming perennial gardens (arranged to have something blooming throughout the season)[1]. One could even plant trees. Trees such as basswood, tulip poplar, and locust are excellent nectar sources.

"So, what should I plant for my bees?"

This question – or variations on it – is the reason I am hashing my way through this topic. How could such a direct question require such a contorted answer? The easy answer is, *"Plant as much as you can of anything the bees find attractive."* The more complicated recommendation would be based on such questions as: (1) how much acreage (space) do you have?, (2) Are you planting for bees only or for honey crops, cover crops, or for forage crops?(3) What other blooming plants are in the vicinity of this planting? Normally, I break the question down into: small areas and large areas.

[1]Theme garden information from Denise Ellsworth, horticulture educator for OSU Extension and Master Gardener program (Extension Office, Summit County, Ohio).

Large areas (> one acre)

Areas as large as an acre could be planted to soil-enhancing plants such as buckwheat or White Dutch clover. A mixture of native wildflowers would convert the area to a spectacular display of color, but for even larger acreages, such plantings become too costly and impractical. Bees of all species and butterflies of all kinds will certainly visit such a large, visible planting. Obviously, it is presently not common for such large acreages to be allocated strictly to pollinators and their flowers.

Smaller areas (< one acre)

Increasingly, a variation on the question of what to plant for bees comes from non-beekeeping property owners who ask, *"What can I plant to help the bees? I have been hearing that they are in trouble."* These questioners usually have small, simple flower garden spaces or other such areas. Even if the question is asked by a beekeeper, my answer is still pretty much the same – *"Plant anything that you can grow and enjoy and that the bees are attracted to."* The actual amount of resources from a small garden will only be enough for a few bees and butterflies, but most of the time only a few bees and butterflies are all that the questioner wanted. In theory, what you plant won't matter, but (and it is a very BIG "but"), if many people provided such plantings, the resource does become significant, even very significant. These small individual plots are fertilized and watered throughout the summer months when other blooming plants have waned. Even the water resource will be greatly appreciated by hot Summer bees that are out foraging for limited water resources.

The Bee Garden at Ohio State, Wooster, Ohio

When the Eastern Apiculture Society meeting was held in Wooster in 1995, the local bee club, the Tri-County Beekeepers' Association was asked to help install a collection of bee plants in a small area called the Bee Garden. The garden is now 15 years old and is all that remains of that EAS meeting held so long ago. Originally, we had an empty English beehive in the middle of the garden for decorative purposes and a heavy wrought iron bench for reflective enjoyment. Presently, in the garden and in the vicinity of the bee lab, about 75 species of flowering plant species are maintained. The 1/10th acre planting does attract hoards of pollinators. Bees, butterflies, hummingbirds, and syrphid flies are common visitors – as well as Japanese beetles. While a 1/10th acre flower garden many sound small, when weeding and managing time comes, it is a significant amount of work.

While OSU grounds staff are very helpful, the body of the garden maintenance is done by Tri-County Beekeeper Association (TCBA) volunteers who have kept the area looking professional for the entire time. It is like a small regional, living library of bee plants. From my occasional walks in the garden, I am comfortable telling you that bees love Lamb's Ear *(Stachys byzantina)* but the plant will not stay where I put it. It grows in the compost area and it invades surrounding plots. I have even noticed a volunteer growing in my lawn. Bees of all species are absolutely goofy about blunt mountain mint (*Pycnanthemum muticum).* It is an unexciting looking plant with small, plain flowers. The bees and butterflies don't see it that way at all. But my favorite in the garden is common English lavender. Bees love it and I love it. My bees and

A section of the Bee Garden at Ohio State. The blue flowers are cat mint, lesser calamint and mountain bluet.

I agree on this divinely smelling plant.

Though there is a lot of bee activity in this garden throughout the blooming season, obviously there is not enough foraging potential for the bees to actually make a crop. Clearly, the garden helps, but just as clear is that there is not enough here for bees to make a living on. So here is the truth – most small pollinator gardens like ours at OSU are primarily there for aesthetic reasons and not purely for the pollinators' benefit. I want to say again that having such a garden is a good thing for bees and for you, but just don't assume that having a small garden will carry the bees' day.

Wild flowers and bees – a natural relationship

Maybe wild flower culturing has always been a big thing and I just missed it. Maybe I have just been sleeping through the wildflower event. Either way, wild flower seeds are readily available via the web. Seed varieties for every region of the U.S. are posted and in some circles, wildflowers are all the rage. On my University campus, patches of grass are being killed and replaced with wild-

A honey bee forager on chive (Allum schoenoprasum) *in the University bee garden.*

Wildflower plot just coming into flower. This would not be a common lawn.

flower plantings. I have working plans to put out Midwest wildflower seed varieties in swaths in my main beeyard. My premise is that, (1) I will not have to mow as much, (2) my yard will be beautified, (3) my bees will be (somewhat) assisted, (4) I will advance my identification abilities of Midwest native wildflowers. If I may, I refer you to my perfect world described in the first paragraph of this article – *"colorful wild flowers are always in bloom eagerly growing wherever I drop a few seeds."* Not always.

Scruffy appearance at times

During the past two years, as we have tinkered with wildflower plots, I must admit that at times, these plots have a bit of a scruffy look about them. As I drive along some of Ohio's roadways, there are frequently "no mow" areas where wildflowers were seeded. Sometimes they are beautiful while at other times, they are not pretty at all. So I am still trying to get my arms around the fact that these plots may not always be presentable by current freshly-mowed-lawn standards.

Wildflower density

I didn't have the opportunity to see naturally undisturbed seeded wildflower areas. They are long gone. Am I unintentionally planting too many varieties too close and too dense when I dump these seed mixes? I have no idea. I follow the instructions. Remember, I am not an accomplished gardener, but rather the flower-loving beekeeper. Even if they are too dense and with too many varieties, these flowering plots are a breath of fresh air compared to just another green lawn. Am I unintentionally propagating wildflowers – but not native wildflowers? Does it even matter so long as they are not noxious species but rather species that are hardy, pretty, and benefit my bees?

Invasive wildflowers and flowering plants

I have written about beekeeping's conundrum before – are our bees right or wrong to pollinate invasive, noxious plants? Some significantly good nectar and pollen plants are on some very bad plant variety lists. Purple loosestrife *(Lythrum salicaria)*, White and yellow sweet clover (*Melilotus alba, M. officinalis*) and common privet (*Ligustrum vulgare*) are three common species that are unwanted in Ohio and in other states. I don't want to argue with anyone but this is not a clear issue. For instance, in Illinois Common Privet is listed as a desirable shrub plant[2] while in Pennsylvania, Common Privet is listed as an invasive exotic plant[3]. Check with various invasive plant agencies in your state before making a commitment to plants that may not be desirable – even if bees do desire them.

What to plant for my bees?

Unless you have a large agricultural location, plant flowers and flowering plants that give both you and your bees pleasure. These plants should not be offensive to your environment and should stay where you plant them. If you have a lot of space, plant the traditional nectar and pollen crop that also complement the land. In every location in this country there are untold thousands of flowering plant types to choose from. You get to choose. I have posted the entire listing of plants in our bee garden and I have presented a list of natural wild flowering plants for Ohio. Go to my web site if you want to download those lists. If you want to go the wildflower route, log onto the web and search for wildflower seed producers in your area. I promise you they are waiting for your call. BC

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[2]University of Illinois. 2010. Selecting Shrubs for Your Home. http://urbanext.illinois.edu/ShrubSelector/detail_plant.cfm?PlantID=416

[3]Mid-Atlantic Exotic Pest Plant Council, Inc. (undated) http://www.dcnr.state.pa.us/forestry/invasivetutorial/common_privat.htm

Is There A PRESIDENTIAL CURSE!

Peter Sieling

The Steuben County Honey Bee Association (SCHBA) isn't the biggest bee club. They don't organize detailed educational workshops, donate large funds for research, or throw big summer picnics with exciting entertainment. What sets SCHBA apart from all the other clubs is its constitution, a confusing collection of rules, procedures, and bylaws that could only have been written by a committee of beekeepers. This might explain what I call the Presidential Curse. It started in 2002 when they elected me president, legally, constitutionally, with 0 votes.

Here's what happened and it is a sad story. When you have two candidates, the one with the most votes becomes president and the one with the second most votes becomes vice president. Ron and I ran. I told the members I'd be VP but didn't want to run meetings. Everyone voted for Ron.

Next month Ron died. That was hard enough. I managed to survive the year as president without impeachment or major schisms. I never mastered Robert's Rules. I'd whisper to Jesse, the secretary, "What's next?"

"Old business," he'd whisper back.

The next Spring all my bees died of American foulbrood. Coincidence? That's what I thought at first.

Fred had been a member for just a couple years when he became president. His bees starved over the winter. Sue took over: chalkbrood, or was it Nosema? Doug's bees were flooded out. (They were on a side hill! Doug said the water ran in the entrances and poured out the top.) Dick got CCD. By 2010 no one dared say what they were thinking but no one wanted to be president. No one volunteered and there was talk of closing up the club and going home.

SCHBA might not have a lot of members but they say that there are almost 1000 years of beekeeping experience in the group when you add the years that all the members have kept bees. I believe it. Most of that knowledge comes from the Middle Ages.

Someone had to break the curse, and as I waded through the 6th Harry Potter book, I realized I was the only one in the group with a scar on my forehead. (My older sister has a lot in common with Lord Voldemort.)

I took the job.

The problem was something called a *quorum*. We needed 10 members to nominate candidates. In the Winter in the North, most members, many in their 80s and 90s, cluster in their homes after dark. That's a good thing, because if anyone crashed their car, who would go tell the bees?

By March we managed to assemble nine members and draft two confused visitors. "Kindly hand over your $5.00 dues and no one will get hurt. Thank you. You can now vote!" Last year's president and secretary didn't attend the meeting. They were both home scraping debris out of dead outs.

"Wait!" cried Don, our constitutional scholar. "According to the constitution, if no one is running against another person and there's a quorum present, the secretary casts the deciding vote!"

"Here's where I made my move against the dark forces. I turned to Mary. "Go ahead and cast the vote." As Mary waved her wand, I muttered, "*Extemporaneous!*" It worked! I am now president of the Steuben County Honey Bee Association for 2010 with one vote. That's a step forward!

What about the presidential curse? I destroyed it. The curse only affects a *legitimate* president. Mary wasn't the secretary until after the vote was cast, so her vote didn't count. Coup d'etat!

What's next? New business, old business, committee reports – who knows, who cares? I'll ask Mary. BC

About the author: Peter Sieling maintains his presidential apiary in Bath NY. He blogs at www.petesieling.blogspot.com

Small Hive Beetle My Perspective

Walt Wright

If you look close, and watch carefully, you'll see why these pests do so well.

An article was published on Propolis where the bees' defense against small pest larvae was described. At that time this beekeeper had not endured a major concentration of adult small hive beetles. Just didn't realize how timely the earlier article was at the time. I should add that the tapering of end bars proposed in that submittal did substantially reduce adult beetle hiding places. Small comfort! The beetles found enough hiding places without that.

We collected a few live beetles in a jar to make measurements of their outer dimensions. The jar and samples were left in the truck for a few freezing nights and the beetles were dead when we took them inside for measurement. Thinking that wouldn't affect the measurements of size, the photo session against a scale in 64ths of an inch proceeded as planned. What was revealed in the photos was much more interesting than the measurements. The beetle is remarkably well adapted to penetration of the bee colony. Forgive me if the following is common knowledge, but it was news to me. The live beetle in the photo 1, extracted from the internet, is not what is available to the bee intent on evicting the intruder from the hive. Head and legs could easily be grasped by the bee, and the intruder thrown overboard. The beetle's defenses have that covered.

Starting with the oval shell or shield at the top, photo 2, there is nothing for the bees to grip with their mandibles. The forward plate over the thorax fits together with the abdomen section like pieces of a picture puzzle. And when the head is retracted at the lower edge, the eyes are mere bumps on the lower edge of the shield. The rear tip of the protective shell is a second plate on the abdomen section. On the internet photo, the area tip is shown separated, but in defense, it makes a tight fit with the forward abdomen section.

The adaptation gets more complex as we get into the details. Some of the following is conjecture based on examination of a couple of dead adult beetles under magnification. I don't have the wherewithal to observe a beetle under attack by a bee. What follows is a combination of observations of beetles in the hive, and interpretation of the pictures provided.

When pursued, the beetle's legs are outboard of the protective shell for speed and maneuverability. And they can motor. In the open, the bee in hot pursuit, isn't closing the gap much, if at all. A bee can run at good speed, but the much smaller beetle is competitive on foot. The beetle, at rest in a pit, has no legs showing outboard of the shield that a bee could grasp with its mandibles. We're guessing that the spikes or pincers at the ends of the legs are to get a good grip on the wax substrate to make it very difficult to move, once hunkered down.

The famous "paddle" antenna is not outboard of the shield, either, when hunkered down. Photo 4 shows the prominent antenna structures

Photo 1.

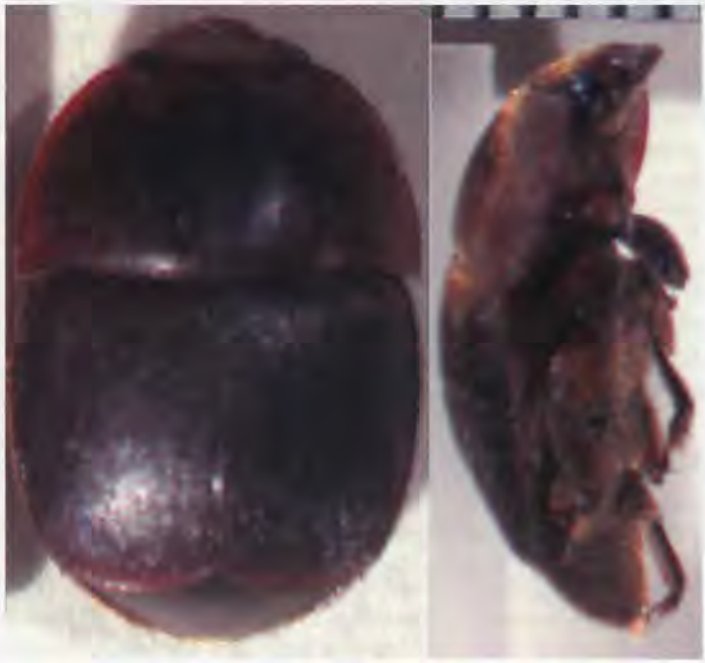


Photo 2.

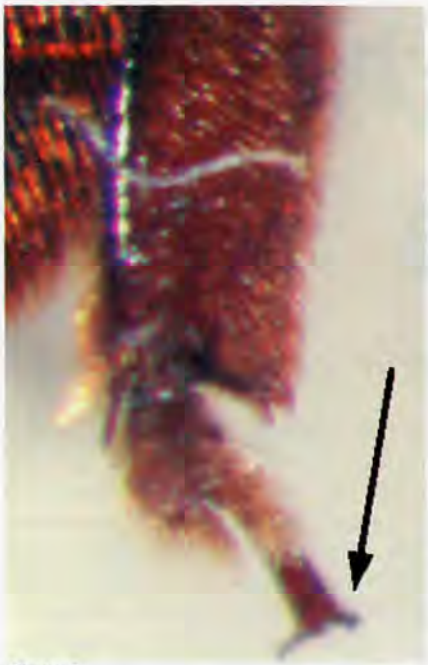


Photo 3.

Photo 4.

folded back on the underside into space tailored to the antenna size and shape. An ingenious adaptation! The right side antenna is outlined for visibility.

My exposure to the beetle has been limited. Smashed one in transferring a nuc to larger quarters in '08. Suspected there might be others that were not seen. Saw a few, dispatched by the flat of the hive tool later in the season. But in '09 had taken a colony to the Nashville club training yard on the Ag. Center grounds. That area is overrun with beetles. It was obvious before harvest in July that the population of beetles was growing fast. Ordered traps and the traps didn't stop the beetle population growth rate.

Removed four (all) honey supers and put them in the freezer for a few days. Saw very few beetles in handling the supers, but when they were removed from the freezer, about 50 dead beetles had collected below. That brought to my attention that one of the beetle's hiding places is the divided bottom bars that I use. The bees are a little careless about filling that space from the underside of a frame.

Beetles increased in numbers through late Summer in spite of traps in the upper levels. In addition to the traps, we tried filling the areas around the top bar ends with wax on hand. The bees showed us where the beetles were hiding by clustering around those areas with beetles the bees could not reach. Frames already in the second – year colony had not been modified to reduce the spaces around top bar ends, as were the new frames of foundation. No beetles at the added, modified frame ends.

Twice, the beetles were shaken off frames, the bees permitted to fly back to the reduced entry, with the top covered, and the beetles left outside the hive. That relief was temporary. To close up the hive top beetle entry places, the inner cover was removed and a screened spacer added for ventilation between the top super and the cover. These efforts to reduce the beetle pressure on the colony were ineffective. Each week, there seemed to be more beetles than the week before.

By early Fall, my worst fears were realized. The bees had given up on rousting beetles. The beetles were wandering around, in and out of empty comb at their leisure, without being pestered by the bees. Still, there was no apparent comb damage by beetle larvae. One last effort to reduce in-hive beetle population before putting them to bed for winter was a more thorough external shake-out. Frames with beetles in empty cells were bumped against hive parts to dislodge the beetles. This was done in the first-frost time frame with comb feeding in progress to backfill the brood nest. (Fall forage non-existent).

My concern for this particular colony was their super gentleness. Perhaps they would not be defensive enough to adequately cope with the beetles. They had been selected for use in the training yard for that gentleness. Beginning beekeepers are already a little gun shy about stings and didn't need to be attacked during a demonstration of procedures.

In my years of working almost exclusively with feral stock no effort was made to cull out the extra-defensive bees. My feeling was that "extra-defensive" might be an asset in the wild with multiple adversaries. I would suit up bee tight and let them take their "best shot." The unanswered question about this colony is – would the beetle have prevailed if this colony were meaner?

There are other characteristics of the Small Hive Beetle (SHB) that tend to make them a formidable foe for both the bees and their keepers. I have no personal knowledge of these features, but they are passed along in the interest of a heads up in the "for what it's worth" department.

The beetle can thrive and reproduce off the land. Although they seek the pollen and larvae in the beehive for their young, that source is not required to sustain the population. We don't know yet how far north they can overwinter, but they are reported to be able to overwinter in a hive – warmed by cluster heating. I doubt that the beetle penetrates the cluster, but that may be the case.

The adult beetle can go for extended (undefined) periods without feeding. They can mark time in their hiding place and wait for the opportunity to lay their eggs. The literature, way back, reported that alarm pheromone triggered egg laying. Presumably, the confusion of the moment provided the opportunity for optimum placement of eggs. That may be true. In the super-gentle hive, where no bee tried to sting me for the whole season, even taking away all their honey supers, there was no

apparent comb damage by beetle larvae. Note: one super of honey was returned after a few days in the freezer purging beetles.

Beetles are reported to migrate cross-country in a cloud or swarm much like the African locust (a grasshopper). Assuming they are nocturnal creatures, you wouldn't see this happening. Also assuming they prefer the scent of bee colonies, overnight, you could have a major infestation of an apiary. I think this was the case for my friend Rob Koss on the gulf cost. All of a sudden, he was inundated with beetles in multiple outyards. He lost a major portion of his season's honey production to beetle damage.

The SHB apparently does not reproduce on an annual cycle like some with which we are more familiar. The June bug, Japanese, and others emerge from the ground at some seasonal cue, have their reproductive orgy, and are gone until the same time next year. Perhaps the more tropical origins support multiple reproductive cycles when conditions are favorable. In the Nashville demo yard, beetle populations grew from June through October. Another hive in that yard, with less owner attention, was checked in early August. When the inner cover was lifted, an estimated 100 beetles were in sight on the frames of the top super. Scary!

An interesting situation occurred on another hive in the yard. A top bar hive (TBH) that had been very active earlier in the season, suddenly died out. I went through the clean-up with the owner. No bees and no beetles. Some cells had stored pollen – no damage. My active hive was overrun with beetles at the time. Is it possible that the beetles key on the bees and not hive scent? Rhetorical question for the experts. If I hadn't been there, I wouldn't believe it myself.

The enlarged photos were taken by son-in-law Roy with equipment available where he worked. Both the pictures and the odds and ends above are intended to get beekeepers aware that the beetle has a slight edge on the bee colony. And the beetle is prepared to persevere until that slight edge pays dividends. The word from here is get ready.

In the meantime, this ex-beekeeper will be applying beetle measurements to design of a better beetle trap. BC

Walt Wright is a hobby beekeeper, retired engineer and beekeeping experimenter from Elkton, Tennessee.

QUEEN BEE 101

Biology and Behavior of Queen Bees

Larry Connor

Who decides queen activities?

New beekeepers are quick to assume that the queen bee is in charge of her fate inside the hive, but the truth is that she is does not determine her own activities, at least not directly, but is responsive to the needs of the entire colony. Queen feeding, waste removal, and supersedure replacement are all the results of the collaborative decision-making nature of worker bees. These decisions are based on chemical information (feedback) the bees receive from the body of the queen. The queen's body produces queen pheromone and hormones that bees respond to. She also produces eggs – both open and sealed brood that influences worker bee behavior. It is a complex arrangement. The queen directly decides very little, but her behavior and core biology determine much of the colony's future and indirectly her own.

Developmental time and what it means

Queen bees are one of two female castes of bees found inside the hive, the other cast being the worker bees. Drones are male bees, and are not a caste, but the male sex. Queens and worker bees develop from apparently identical eggs that are deposited into a cell by their mother queen following successful mating with multiple drones, and have two sets of chromosomes, and thus are *diploid* individuals. Worker bees are unable to mate, thus in queenless and broodless situations produce eggs with a single set of chromosomes. In bees and other social hymenoptera individuals with one set of chromosomes develop into males, and are thus haploid.

Queen bees have the shortest developmental time, running 15.5 to 16 days from the time the egg is placed into the cell to emergence of the new queen from the queen cell. Some strains have shorter developmental times, and African queens are known to develop in just 14 days.

Virgin queen lacks the swelling of the abdomen that laying queens possess.

Once a queen emerges from the cell she will feed herself and be fed by nurse bees inside the hive. After a week or so the queen will make orientation flights and then mating flights, usually mating with 12 to 20 different drones. After several days of grooming and feeding by nurse bees inside the hive the queen will start to lay eggs into worker cells emptied and polished by the bees in the brood nest. Once a queen starts to lay eggs she does not mate again, meaning that any shortage of sperm will not be corrected, and the fate of the queen, and perhaps the hive, is set.

In Nature old and inferior queens are replaced through the supersedure process. When the queen's pheromone production drops to about half of its normal level (and the amount of brood also drops), then certain larvae are selected, their cells are enlarged, and the peanut shaped queen cell is built on the surface of the comb. There are usually only three to nine supersedure cells produced in the average colony, and the cells may be located anywhere on the surface of the brood frame. Worker bees combine their skills to produce queen cells, for it requires nurse bees for the production of royal jelly, and house bees for the secretion of honey to produce beeswax and sculpt the queen cell. Other bees are concerned with temperature stability to insure proper queen development.

Mating, egg-laying and sperm storage

Queens and drones fly on warm and calm afternoons during normal flight periods. They travel to Drone Congregation Areas where the queen is receptive to the many drones that follow her pheromone plume and her dark form against the sky. DCAs may be located anywhere around an apiary, and can be found by careful tracking with helium balloons, kites or radar. Mating occurs 50 to 150 feet off the ground, and are thus rarely seen by humans.

Queen bees produce about 150,000 eggs per year, and depend upon two large ovaries (often nearly filling the abdomen) filled with about 370 thin tubes called ovarioles, that produce eggs on a continuous basis. In the peak of the season a queen will produce about 1,500 eggs per day, although larger numbers have been reported. These may be due to a sudden burst of activity by a queen that is being stimulated by very favorable weather, food supply and genetic programming. Reports of queens with egg-laying rates of 3,000 may be a reflection of a second queen in the colony (the mother queen and her supersedure daughter, an event that occurs in over 10 percent of vigorous Spring colonies.)

Queens store the sperm from the multiple drones in a clear, fluid-filled sac or sphere located near the tip of her abdomen called the spermatheca. This structure is covered with a fine network of breathing tubes, called trachea, that bring oxygen to the sperm stored there. The spermatheca floats in the blood of the queen, and receives constant nutrition. The spermatheca holds five to eight million sperm, but a failing queen my have only a few thousand sperm, and can be identified by drone cells within the worker brood pattern in the hive.

We are not sure how a queen determines when she has mated with an adequate number of drones, but when she has finished her reproductive flights her median and two lateral oviducts are filled with sperm. The nurse bees massage her body and remove the drones' sexual fluids, while about 10 percent of the sperm successfully migrate through a spermathecal duct into the spermatheca.

In one to four days the queen will begin to deposit eggs into worker prepared cells.

Longevity of queens

Some queens only live for a few weeks when the worker bees decide for reasons we do not completely understand to replace the queen with another. Sometimes queens stop laying eggs after several days, and no queen cells are produced from the eggs and larvae in the hive. Other queens will produce a good brood pattern for several weeks when the colony decides to replace her with a daughter queen.

Once a queen is well established in a hive we expect her to remain for a year or more. Some reports of older queens are common, some as long as five years. Commercial beekeepers replace queens at least once a year (in Southern locations and migratory operations) or less often in non-migratory, Northern operations. Small-scale beekeepers will keep queens in a hive for a longer time period as long as the queen continues to perform well for the colony. Bee breeders attempt to select queens that maintain egg laying for as long as possible, in the attempt to select for genetic longevity within the bloodline. With selection, breeders keep productive queens for five years.

Behavior of Queens and Workers

Queen cells and worker bees – As queen cells develop, the fully formed adult queen confined inside the queen cell produces some of the chemicals that make up part of her queen odor or queen substance (pheromones). Worker bees surrounding the queen cell (keeping it warm) remove the wax tip of the queen cell to expose the silk cocoon tip. It is widely thought that the workers will keep these cells under closed surveillance, monitoring the development of the queen inside the cells. When the queen is ready to emerge she will use her sharp mandibles to cut her way out of the cells. Almost immediately she will move to other queen cells, her sisters, and chew a hole into the side with her mandibles and then sting the queen inside the cell. Worker bees do not interfere with this behavior, but remove the dead queen and her cell after a time period.

Sometimes supernumerary queens are produced in a colony and are held hostage inside the queen cell until the bees determine the proper time for their emergence. The worker bees add beeswax to the incision the queen makes to cut herself free from the cell. However, the workers are careful to feed such a queen to keep her healthy.

Laying queen with large body size. Does this make her a good queen? Her colony was loaded with chalk brood, so my answer is NO!

Newly emerged queens – After a newly emerged queen has finished killing her sisters, she moves rapidly over the combs. She does not yet have the pheromone production she will have as a laying queen, and for the first 12 hours or so her odor level is quite reduced. After twelve hours her odor production is enough for the workers to respect her as an unmated queen, and to attract drones to her in the DCA for multiple mating.

Some beekeepers use smoke, strong odors and other techniques to introduce virgin queens. These may work under certain conditions, but as a general rule, virgin queens should be introduced in a queen cage with a candy release plug or a push-in cage. These are the same methods used for a mated queen. With virgin queens there are two additional risks. First, virgin queens are able to fly and often do, causing a loss. Second, the queen has pheromones of a queen and should be treated as a queen and not a young nurse bee from another colony.

Virgin queens at the time of mating – Worker bees fly with the queens when they leave for the mating flight. I have not learned of a reason for this mating swarm, but it is common in other social insects. Perhaps it is a method of increasing security against predators. Back at the colony, there is a change in the behavior of the house bees as mating is underway. The bees no longer store pollen and nectar in the key brood cells, but remove the food by eating it, stimulating both royal jelly and wax production. The emptied cells are cleaned and polished to provide a place for the queen to lay. The sharp-eyed beekeeper may not be able to find the queen before her abdomen starts to swell with egg laying. (This is a hormonal response to the mating process.) Once there is a large area of polished brood cells, it is likely that there will be eggs in those cells in a day or two. From the time of the last mating flight to the first eggs queens may require one to three days for the hormonal changes to take place and for heavy feeding by workers to begin to stimulate egg production.

Newly mated queens – It takes at least four weeks for a queen to fully mature from the time she emerges, mates and starts to lay. During this month-long period it is possible to disrupt the delicate balance between the queen and her colony (remember, these bees are not her daughters until the first brood emerges at three weeks).

When the queen's pheromone production drops to about half of its normal level then certain larvae are selected, their cells are enlarged, and the peanut shaped queen cell is built on the surface of the comb.

If the queen has been introduced to the colony from another source, she may not even be genetically related to the queen, and the balance is even more fragile. There are reports of poor introduction and early rejection of queens introduced into unrelated stocks, like putting a dark-race queen into a yellow Italian hive. There are undoubtedly genetically determined variations in pheromone production as well as key queen behaviors that worker bees monitor and we know very little about!

Laying queens – Once established queens may be checked every two to four weeks to make sure she is doing her job. We will discuss queen finding later, but I like to have a queen that is clipped and/or marked and then rely upon the presence of eggs and young larvae and a nice brood pattern as evidence that she is doing her job. Some colonies may only require a queen check once or twice a year for many small-scale beekeepers. And less than that for commercial beekeepers.

Grand Old Ladies! – We all develop favorite queens and may want to have a set schedule of queen replacement. I view older queens, those two years or older, as Grand Old Ladies that must get some respect when they continue to produce a quality brood pattern and a gentle, productive, Winter-hearty hive. She can be converted over to drone production if she is not used for grafting, for you want these traits increased in you apiary – it is a never-ending challenge in beekeeping.

Sometimes beekeepers move these older queens into smaller hives and keep an eye on them and use them for grafting. A double five-frame nucleus is great for this. The older queen can be used to establish a five-frame nucleus and then a super added as the colony expands. Removing a frame of graftable larvae will reduce the population of the hive (I put the extra open brood into the cell builder colony), and keep the older queen in balance with her reduced egg laying. Pull out frames with supersedure cells and produce nuclei with them to keep her genetics in your apiary. This is part of the Art of Beekeeping that provides me with so much satisfaction. Letting these Grand Old Ladies die a natural death seems like a fair trade for a number of highly productive seasons. It has nothing to do with being a businessperson, but a great deal about your appreciation of genetic diversity, longevity and productivity.

Next month we will deal with issues of finding the queen, replacing and introducing queens (especially in the Summer months), and a discussion of managing queens in packages, nuclei hives and a wide range of queen problems. BC

Dr. Connor will be teaching a queen rearing class in Michigan this month, so check ***www.wicwas.com*** *for details. For more information on bee reproduction, consult a copy of Bee Sex Essentials.*

Gwen Rosenberg

An Apple For The Teacher . . . The Kids, The Parents & The Future

Tomorrow is the most important thing in life . . . It hopes we've learned something from yesterday."

John Wayne once said in a movie "You're taking the long way around the barn . . ." in an effort to speed up a slow talking ranch hand. I've always wanted to be more like John Wayne. Just once I'd like to punch a law-man-government-bureaucrat who saw fit to cut honey bee research funding . . . again. I'm not going to start swinging though, not because I shy away from a fight, but because I respect the long arm of the law.

Besides there's a more effective and lawful way to make my point, by taking the long way around the barn. My goal is to convince people that honey bees are worth saving. They are worth the investment of research and protection. From my small homestead, I lack the influence of the governor of the territory to make any dramatic or immediate change in policy, so let's take a walk around the barn . . .

Last March I submitted a proposal to my local school district here in Ohio. "Let's plant an apple orchard!" I said. "Let's show the kids what an apple looks like growing on a tree. Let's let the teachers go sit in the orchard and teach science class."

School gardens are springing up all over the country and so long as you live in Berkeley, California, you have a good chance of actually growing anything during the school year. During the school year in Ohio, our school gardens can't provide much more than spinach and kale, possibly cabbage. Even my Eastern European forebears would have had a hard time getting enthused about radishes. So I chose apples. There will be flowers in the Spring and fruit in the Fall. It's Ohio's version of the school garden.

Apple trees were an obvious choice for Ohio. Johnny Appleseed is our unofficial childhood hero. Every kid in school learns about Johnny Appleseed. Kindergartners make construction paper apples and older kids wear pots on their heads during dramatic reenactments of Johnny's apple planting campaign. The state even has an official state apple, the Melrose. I suggested that we plant melrose, golden delicious and jonagold. It would have been downright unpatriotic to refuse.

My proposal wasn't refused, in fact, it turned into a rodeo. The original idea was expanded to include not only apples, but grapes and raspberries too. The school superintendent, principal and the teachers are excited to incorporate apple blossoms into life science classes and the special education teacher requested an outdoor thermometer. She's been trying to demonstrate the connection between frost on the ground with the air temperature. There will be bluebird boxes on the fence posts, and a sundial in the middle of the raspberry patch. The high school urban forestry classes are going to prune the trees, and the WOODLINKS cabinetry class is sifting through bench plans for next semester's class project.

For the first few years, the raspberries will be the only thing fruiting until the grapes grow. Eventually, there will be apple blossoms and then maybe a couple apples will grow from a gangly limb or two. Library books and the imagination present in the teachers' lesson plans will have to maintain interest until the apples really begin to grow. I'll come each Spring and talk about beekeeping to the kindergartners. Maybe I'll leave a hive and some equipment out on earth day for the older kids to pick apart freely. As the orchard grows, the weather, the sun, and the dirt will become more important to the students because it will have an impact on their orchard. As the trees become more productive, the students will pick an apple instead of cutting one out of construction paper. They'll want to know why a tree died, how worms get into apples, and why a late frost is so destructive.

The deer will come, the meadow voles and the honey bees. One year the blossoms will be rained out, left unpollinated and useless. This traumatic and frustrating year might be the greatest opportunity. It will linger in the mind's of the school children and reappear many years or decades later like the blurry flashback that's the hallmark

of a spaghetti western. Only the kids won't be remembering a bandito raid or burning barn, they'll remember that sometimes the apple trees grew bushels of crisp apples and sometimes there weren't any apples at all.

Threats to honey bees will be real to these future nutritionists, grant writers, researchers, and budding politicians. These kids aren't going to need CNN to find out why they should care about chemical pesticides, CCD and honey bee shortages in almond country. Somewhere lingering in the back of their minds they'll remember caring an awful lot about sunshine, pollination and apples.

One of the last remaining apple trees planted by John Chapman...Johnny Appleseed, about 15 miles west of Wooster, Ohio.

The recent newspaper articles on CCD have taken on all the terror of an ambush in Coyote Canyon. You know there's something to be terribly afraid of, but you can't see the enemy and you're not sure why it's attacking your wagons. The media posse works great at scaring people for short periods of time, but sustaining that level of interest is nearly impossible if you've never had a reason to care.

Childhood education is a long, long, walk around the barn. Planting an apple tree is a first step in cultivating an interest and a genuine concern for how food comes to us. Observing a honey bee inside an apple blossom is the next step in understanding how interrelated our food, environment and farming practices must be. Beekeeping should be considered a natural extension of that education.

Beekeeping now has the feel of a side show act – a rarity, equally fascinating and scary at the same time. Beekeeping is a natural partner with biology, ecology, agriculture and nutrition. It's a part of the bigger picture that when introduced early, makes perfect sense later on in life. Rather than being ambushed with poorly understood threats these kids are going to have some basic understanding of the interconnectedness of our food and honey bees. Some kids may even become beekeepers.

In reality, most of the kids who planted those apple trees won't ever become beekeepers, but they'll all vote, and they'll all spend their money. A lot of these kids will have careers making decisions that affect laws, the environment, or education. There may even be some kids who grow up and support beekeeping research – that's the long way around the barn, pilgrim.

John Wayne may not have chosen my approach of reaching out to children and asking them to think about apple trees and honey bees, but he would have liked it. I know he would have understood it, because he also said "Tomorrow is the most important thing in life . . . It hopes we've learned something from yesterday." BC

Gwen Rosenberg plants trees, keeps bees, and dogs and boys in Kent, Ohio.

If You Can Make It In

NEW YORK

Brian McDermott

There's a growing desire by city dwellers to reconnect with their food supply

Megan Paska was breaking the law in broad daylight.

It was June 2009, and she was bustling around the roof of her Greenpoint, Brooklyn, apartment building. With the baking Manhattan skyline as a backdrop, Paska put on a black sunhat attached to a black veil. Then, with a smoker in hand, she began to tend to her two beehives.

Paska gingerly pulled out each frame of the first hive and chipped away the comb. Like hundreds of other New Yorkers, she was violating Section 161.01 of the NYC Health Code, which outlawed keeping bees and other "venomous insects." A neighbor's complaint could lead to thousands of dollars in fines for hive owners.

Just nine months later, in a unanimous vote, the New York City Board of Health changed the code to legalize beekeeping. In a city known for grindingly slow government – think of the World Trade Center construction site – how did beekeepers win such a swift victory?

Philosophically, the answer is a story about the growing desire city dwellers have to reconnect with their food supply. Practically, it's a story about Facebook pages, online petitions, and a "Hidden Hives of New York City" media tour: to wit, shrewd lobbying by non-profits in a post-Michael Pollan world.

On that sunny Saturday in June, the campaign to legalize beekeeping was in full swing. A "Beekeepers Ball" was weeks away. Paska herself had permission from her landlord to put two colonies on the roof of her apartment building. She asked her neighbors. "They're not going to get in my air conditioning?" asked one. After assuring him they wouldn't, Paska felt comfortable starting the two hives in April 2009.

"It's really empowering. It's really awesome," said Paska. "It's definitely a responsibility, like any other pet, but this pet happens to give me food, and make my garden produce more food. And my neighbors, they get more food out of their vegetable garden crops too, which is great."

I met Paska at a meeting of the New York City Beekeepers meeting in Manhattan in April 2009. She was one three dozen or so city beekeepers, many of whom were new to the hive. Speakers couched their presentations in cautious legalize, careful to remind the crowd that beekeeping was illegal.

The conversation ranged from the basic (how to tell which was the queen) to campaign tactics ("The allergy people are the biggest opposition.") to the practical.

"Would it be stupid to bring bees on the train?" asked a woman interested in setting up a colony.

As in many other big cities, interest in farmers markets, CSAs, compost heaps, and urban chickens has exploded in New York City in the 21st century. Non-profit advocates of those eco-conscious mainstays were the most vocal organizations to champion legal beekeeping.

In 2008, Just Food, a non-profit located on a not-so-bucolic stretch of Sixth Avenue in Midtown Manhattan, began agitating to legalize beekeeping. At first, said Food Justice Program Coordinator Nadia Johnson, she had to call 20 people just to try and figure out where to begin her campaign. She found David Yassky, then a city councilman, who in January 2009 introduced a bill into City Council to legalize beekeeping.

Then, crickets.

Just Food and likeminded organizations kept working. There was a Facebook group, and a logo with a melancholic bumblebee holding a protest sign with a "bee" pun. There was a "Beekeepers Ball," which was part of "Pollinator's Week." A petition drive yielded thousands of signatures.

By late 2009, as Paska's 80,000 bees hunkered down for their first winter, Johnson saw signs that Department of Health was open to lifting the ban. In February 2010, the Board of Health held a public comment session, and on March 16, in the crowded fluorescence of a conference room on one of the first warm days of the year, the board voted unanimously to lift the ban. One person let out a few claps, and it was done.

It was a happy day for beekeepers.

"It feels pretty damn good to know that I can actively pursue my hobby and share my experiences with fellow New Yorkers without the man busting my balls about it!" wrote Megan Paska in an email.

With beekeeping now legal in New York, the legalizers can turn to smaller pastures. *Bee Culture* magazine and thedailygreen.com have compiled a list of 79 cities and towns and counties thay STILL do not allow bees to be. Check it out at **www.thedailygreen.com/environmental-news/blogs/bees/illegal-urban-beekeeping-0602**.

Interest in NYC is high. *The New York Times* covered the legalization process, and a generation of city dwellers are carving out natural spaces in community gardens, joining CSAs, and paying attention to the provenance of their food.

James Morren and girlfriend Erin Roche are two such people. Morren had volunteered on a farm, and decided to start a colony in the backyard of his South Slope, Brooklyn apartment in 2009.

photo by Yeshwant Chitalkar

"The main reason I got into it was the benefits of honey," said Morren. "The actual raw honey has bits of the propolis and the actual comb that the bees make, and that has real health benefits," he said.

"Adding diversity to this urban environment, it really does help strengthen the plant life, and you in turn get to reap the benefits."

Cities offer a unique landscape for beekeepers. Morren and Roche's hive sat at the back of a dining-room-sized yard. When I met the pair to watch as they opened their hive, a neighbor closed her open back door because she worried about her children. Morren, like Paska, lives in a row house.

Yet those bees, even from the cramped home base of New York City's legendary real estate squeeze, have ample opportunity to pollinate. Within their two to three mile radius are Prospect Park, Greenwood Cemetery, dozens of community gardens, and thousands of houseplants.

"Our cities, groomed and cosmopolitan as they appear, still obey the basic rules of nature," writes Mark L. Winston in *From Where I Sit: Essays on Bees, Beekeeping, and Science.* "Managed honey bees in the city provide a major public service by pollinating gardens, fruit trees, and berry bushes, and should be encouraged rather than legislated out of existence."

Will legalized beekeeping prove the famous maxim "If I can make it here, I'll make it anywhere?" Across the nation, groups like Just Food are trying. The interest is there, and so is the pollen. BC

Brian McDermott is a journalism professor at the University of Massachusetts Amherst. His work has appeared in the New York Times and many other publications.

BIGGEST IN THE UK
STONELEIGH

Peter Smith

This three day beekeeping event is unlike anything else you've seen.

There are two large bee events in the UK each year. The First is the Spring Convention held towards the end of April at The Royal Show Ground near Coventry and the second is the National Honey Show held at the end of October – this year it will be at Weybridge, just to the SW of London.

The Spring Convention this year lasted three days – Friday, Saturday and Sunday. The show occupies several halls of exhibitions, sales stands and demonstrations, as well as workshops and lectures. The sales stalls usually have many goods at knock down prices so the event is generally very well attended. I decided to visit on the Saturday which was the day the trade stands were open for business.

The day dawned sunny, bright and warm compared to the very chilly weather we have been having. Off in the car to drive the 80 or so miles from my home to Stoneleigh.

First thing that was noticeable along the way was that there was no oil seed rape (Canola) flowering in the fields along side the motorway. Usually the fields are all bright yellow, but this year I only saw two fields in flower, probably due to the coldest and longest winter for some 30 years.

Arriving at the show ground, it was apparent that things were going to be different. Instead of driving to the usual car parks, there were lots of little men in yellow florescent jackets directing cars on a guided tour of the show ground to car parking areas away from the exhibition buildings.

The exhibition halls had been open only half an hour when I arrived, but already lots of people were making their way back to the car park areas from the sales halls, loaded down with bits of hive, packs of frames, bags of foundation, even a large stainless steel extractor – two people for that.

Queue up at the pay desk. £15 ($23) if you're a BBKA (British Beekeepers Association) member, £20 ($30) if you're not. Get the sticky wrist band and then try and fight my way into the halls. As last year, lots of visitors seemed to have studied the best place to stand and talk to other beekeepers and block everyone else's access.

The programme contained a 'Programme Changes' slip which read 'Due to the General Election and the Icelandic volcano eruption a number of changes have had to be made to the Programme'. There followed a revised list of speakers and their subjects.

I grabbed a quick cup of coffee and a bun before commencing the battle proper.

I should point out at this stage that beekeeping equipment in the UK is – to say the least – somewhat expensive. For example, a 'National' super without frames, from a leading manufacturer, costs £37 ($55.50) and £66.95 ($100.50) with. A Langstroth super costs £32.41 ($48.60) empty and £66.30 ($99.45) with frames. Other pieces of equipment are similarly expensive.

It goes without saying, therefore, that any chance of a bargain will be quickly snapped up and this happens at Stoneleigh

Bargains galore.

Guarding the bits left behind.

What kind of hive do you have?

IBRA's book stall.


Brian Sherriff's suits – all color this year.


We need more room!

with a vengeance. The budget hive parts and frames usually go in the first hour or so and there are also lengthy queues at the stalls selling Foundation until stocks are exhausted or nearly so. Of course, the large volume of quite heavy wood work and other items has to be taken back to the cars some hundreds of yards away from the sale point and for this, in the past, small trolleys have been used. With the crowded conditions in the halls, the trolleys have become a nuisance – if not a danger – and as a result were banned from the halls this year. This resulted in lots of mutterings and people having to stand guard over heaps of bits and pieces while a companion carried some of the items back to the car before returning to the halls for more.

Very obvious were the Bee Suits. Instead of being mostly white or khaki, this year there were many in fashionable pastel shades.

Then there was a queue five yards long for foundation at one stall, duplicated at two others. There seemed to be a crush three people deep at several of the equipment stands.

There were lots of newcomers to the hive supply business. Some hives in plastic, some in plywood, others in reconstituted wood. One or two were reasonably cheap but they haven't been around long so durability is a question.

Several charities had stalls there. The ones supporting beekeeping in Africa seemed to be the most popular.

There was a workshop at which beginners could learn to assemble a hive and take the resulting trophy home with them. The cost for this tuition, with the completed hive, was £70.

I did hear complaints that the talks in the various venues were difficult to get into because of demand for a seat.

Outside the halls were vans and lorries (Sorry! Trucks) taking beekeeper's surplus wax. The Main dealers have schemes whereby beekeepers can trade in their beeswax for money or new wax foundation at agreed rates and this is quite popular. It is amazing to see the huge piles of wax and then imagine the number of bees required to make it.

This year, beekeeping Associations in the UK have been swamped with applications to attend the spring 'Beekeeping Beginner's' Course. Our Association had some 95 applications. It was not surprising, therefore, to see lots of 'beginners' taking advantage of the 'Sale' prices acquiring the various bits and pieces necessary for them to practice the craft. The problem will be when they all want bees – which are in quite short supply.

I was trying to take a few photos of the sale rooms and the crowds and although I'm nearly 6′ 6″ tall, I needed a higher vantage point. At the end of one hall, there was an emergency exit with flight of some six steps, probably six feet wide, up to exit doors leading out of the building. I attempted to stand on one of the steps only to be told by a rather officious little man that I couldn't use the steps as they formed part of an 'Emergency Exit.' I pointed out I should be no more than a couple of seconds and if he hadn't intervened, I would have taken the photo and departed his steps. He was there several hours to my knowledge and I reflected upon what he would have put on his passport application under 'profession' – Guardian of emergency exit stairs?

By lunch time, most of the 'sale' items had gone but there were still many people looking for bargains. For first time visitors a visit to the convention is quite an experience. Having kept bees for 20 years and now reduced from 25 colonies to four, I didn't need to buy anything apart from some replacement gloves.

It is still a pleasure to visit the various stalls and see the latest gizmos and gadgets that the suppliers would like you to think that you needed. It's also great to meet up with old acquaintances and chat – hopefully not blocking access ways!

I wonder what it'll be like next year. BC

Peter Smith keeps bees outside of London.

YOUR GARDEN CORNUCOPIA

Ann Harman

It's mid-Summer and your bees performed their pollination work very well. Your vegetable garden is producing. Your zucchini plants are making so many zucchini you have nightmares about them invading Planet Earth. You have a feeling that you'll be carving a Labor Day pumpkin. Your neighbors seem to be getting tired of cucumbers. At least it will be a few months before the apples ripen. Bees plus vegetable gardens equals overwhelming success.

After leafing through seed catalogs and visiting nurseries you managed to plant a very nice bee-friendly flower garden. You probably thought more about your dinner table than bees when you planted your vegetable garden. But most of the veggie plants are bee-friendly also. The squashes, cucumbers, beans, pumpkins, gourds, berries, melons, watermelon, and the herbs have all attracted honey bees and the plants have responded by giving you bumper crops of well-pollinated vegetables and fruits. Your tomatoes and potatoes will just have to take care of themselves or wait for a passing bumble bee.

Did you plant any broccoli? You actually picked and ate the tightly closed green flower buds. It would be nice if you could dedicate one plant for your bees. Just don't pick the broccoli crowns or heads. Let one plant bloom. You will find bees just love to visit the golden yellow blossoms, even if the blossoms are somewhat tiny. Try the same on your mints and herbs. A few stalks allowed to bloom will attract bees also. Of course you want your lavender plants to bloom. Before you harvest all of the stalks, leave a few for the bees. Honey bees will eagerly visit corn when it is tasseling and producing pollen. Although the pollen is not a particularly nutritious one for honey bees, it will contribute something to their diet. Also it does give them something to do.

I would hope that you are watching the harmful insect population and taking a non-pesticide approach to your fruits and vegetables. I always hope that somewhere reasonably close is a nest of yellow jackets. Although disliked by many, the yellowjackets are very beneficial in vegetable gardens. Since the yellowjackets need to feed their larvae protein in the form of insects and insect larvae, they will keep down the population of insects doing harm to your garden. Unfortunately the yellowjackets do not do a food-source dance to their nestmates so you will have to wait for the workers to discover your garden. When they do they will return over and over again throughout the days something is chomping away at your plants. Watch for the yellowjackets and let them do some of your pest control work. You just may find their hunting forays are fun to watch. Remember that a foraging yellowjacket has nothing to defend so she will not attack you. Just try not to have a collision.

As you wonder what to do with all those zucchini keep in mind that in January you will think of them fondly and wish you had more to eat. In a way you can. Zucchinis do not freeze all that well. They just seem to turn to a watery mush when thawed. But here is a way to enjoy your harvest in the middle of Winter. Make zucchini pickles! Here's the recipe. By the way, the salt you use in making pickles should be canning and pickling salt, free from anti-clumping substances.

ZUCCHINI BREAD-AND-BUTTER PICKLES

2 quarts apple cider vinegar
2 cups honey
6 tablespoons salt
4 teaspoons celery seed

4 teaspoons dill seed
2 teaspoons ground mustard
8 quarts fresh zucchini, sliced
2 quarts onions, sliced

Bring vinegar, honey, and spices to a boil. Pour over zucchini and onions. Let stand for two hours. Heat mixture to a boil and cook for three minutes. They will get mushy if cooked longer. Pack into hot sterilized jars. Insert a knife down the edge of the jars to remove any air bubbles. Complete seals. Process for 15 minutes in a boiling water bath. Yield six quarts.

Putting It Up With Honey
Susan Geiskopf

Find out when your county agricultural fair is and what vegetables and herbs you can enter. You may have entered your honey in a fair or in a honey show. If your honey won ribbons I am sure you used those as advertising to let your customers know that your honey is indeed superior.

You need to win a few ribbons with your vegetables and even jams and preserves made with honey. Farmers' markets all tend to offer the same types of vegetables during the Summer months and even a roadside stand has what every other roadside stand has during July and August. A ribbon-winning tomato or cantaloupe should lure customers and help you diminish your bumper crop. Just as you give friends, relatives and customers honey recipes, you can offer fruit and veggie recipes, too. If the recipes contain honey, so much the better!

As beekeepers we are encouraged to keep records so that we can remember what we did that was successful as well as what didn't work. You should do the same with your garden. Do you really think you'll remember next January when seed catalogs arrive just which tomato was absolutely delicious and problem-free and which one was just so-so? Use a notebook or use your computer, just like you do with your bees.

July weather is usually hot and in many places humid. Garden work is best done early in the morning or as the day cools off in the evening. You deserve a cool treat. Are your melons ripe? Good. Try this recipe.

CHAMPAGNE MELON SOUP
3 cups cantaloupe
3 cups honeydew
1 cup fresh orange juice
2 tablespoons fresh lime juice
1-1/2 tablespoons honey
2 cups Brut champagne
Mint leaves to garnish

Scrape out the centers of the two melons with a spoon. Process the melon pieces in a food processor. Add the orange juice, lime juice and honey. Process until smooth. Refrigerate the soup and chill the bottle of champagne to be opened later. Within ½ hour of serving, pour the champagne into the soup. Stir to blend well. Serve in chilled wine glasses or glass cups rimmed with sugar. Garnish with mint leaves.

From The Hive To The Table
Stanly County, NC, Beekeepers Association

During the heat of the Summer your garden toads need a cool place to rest in during the day. A flowerpot turned upside down with a "door" broken out of one side will allow them to shelter from the midday sun. I have even seen "toad houses" for sale. The horned toad (really a lizard) of the southwest just digs into the ground to keep cool. A nearby birdbath will keep the birds around. Both the toads and the birds are good insect control for your garden.

In a few short months Summer will be disappearing and the harvests of Autumn will begin. But there will be one day when the weather report says frost is expected during the night. Your garden is still producing but some of the plants are not frost-resistant. Panic sets in. What to do? Go out and gather what you can and make a batch of these pickles.

SEASON'S END MIXED PICKLES
2 cups sliced cucumbers
2 cups chopped cauliflower
2 cups sweet peppers
2 cups chopped carrots
2 cups sliced onions
2 cups chopped green tomatoes
2 cups green beans cut into 1-inch pieces
2 cups chopped celery
2 tablespoons celery seed
4 tablespoons mustard seed
4 cups vinegar
2 cups honey
4 tablespoons turmeric

Soak the cucumbers, peppers, cauliflower, tomatoes and onions overnight in a solution of one cup salt to four quarts water. Drain well. Cook the carrots and beans in boiling water until tender and drain. Mix all the vegetables together with the remaining ingredients and boil for 8 minutes. Pack into hot sterilized jars to within ½ inch from tops. Complete seals. Process for five minutes in a boiling water bath. Yields eight pints.

Putting It Up With Honey
Susan Geiskopf

Although you are busy with your gardens and the produce, give a thought to next year. What can you do to make gardening easier? What companion plants do you need to use to combat the pests particular to your area? Make these notes now along with your records.

One more thing – go over to your hives and say thank you to your bees. BC

Ann Harman's garden is overflowing this Summer out back at Flint Hill, Virginia.

Honeydew, and Honeydew Plants

Not Common, But Commonly Produced

Connie Krochmal

Nectar comes mainly from flowers with a small amount derived from extrafloral sources. Some honeys are derived from honeydew.

Honeydew is defined as the sticky, sugary liquid exuded by certain insects that feed on the plant sap. Plant leaves can become covered with honeydew. While some report that honeydew is also exuded by the leaves of certain plants, most experts hold the view that it is strictly an insect product.

Adult female aphids, also known as plant lice, are by far the main producer of honeydew. Other insects that exude honeydew include scale insects, white flies, gall insects, mealybugs, and leaf hoppers.

Collection of Honeydew by Bees

Usually, this occurs mostly during hot, dry Summers, especially during droughts. Sometimes it is also collected during the late Spring as well. For certain plant species, honeydew is available up until frost.

Whenever floral and extrafloral nectars are available, bees tend to ignore honeydew. The honeydew must be harvested when it is still in its liquid state. It is typically gathered during the morning or late in the day. At other times the high temperatures cause it to harden.

Analysis of Honeydew

Generally, the nutritional content of honeydew differs markedly from that of floral honeys. Often they're higher in gums, dextrin, minerals, sucrose, and ash than other kinds of honey. For example, some contain 10 times as much ash as floral honeys.

The Qualities of Honeydew

In general, most honeydew tends to granulate rather rapidly, sometimes faster than it can be extracted from the comb. However, there are some exceptions.

For various reasons, the quality and other characteristics of honeydew can vary greatly. The color, body, and other qualities of honeydew depend not only on the plant from which it is derived but also on the sucking insect feeding on the plant.

Top quality honeydew has a very sweet, pleasing flavor, and is often clear or light colored. Some honeydew, such as that from pine, will be darker in color. In some cases, the dark color is due to mold growing on the honeydew. Good quality honeydew is in demand among consumers, and compares favorably to floral honeys.

Honeydew that is collected promptly in its fresh state by honey bees is usually a desirable honey. In order to be good quality, it must be gathered in a timely manner. This is a major factor in determining the quality.

On the other hand, the quality of honeydew can suffer greatly if it remains on the plant leaves for an extended period. If it is allowed to repeatedly dry and re-liquefy before it is collected by the bees, it will be inferior.

Uses of Honeydew

Good quality honeydew is used as a table honey and for cooking. Some of the best known types of honeydews are in demand, especially as a table honey. These are also very popular among bakers and candy makers.

With the exception of certain species of lime (*Tilia spp.*), the other honeydews are considered suitable Spring and Summer foods for honey bees. Honeydew shouldn't be used as Winter food for bees because it can cause dysentery, apparently due to the high ash and gum content.

Plant Sources of Honeydew

Honeydew is derived from insects feeding on various plant sources, including deciduous trees and shrubs as well as conifers and cultivated crops.

The following deciduous trees and shrubs are regarded as common sources of honeydew.

Ash (*Fraxinus spp.*)

Worldwide there are about 70 or so species of ash. Of those, over 15 are native to the U.S. Though they're more commonly found in the East, some species occur in the West. These can be trees or shrubs. Some are grown as landscape plants.

Basswood (*Tilia spp.*)

Also known as linden, four species are native to the East. In addition, a number of the introduced species, some of which are sometimes called lime, are cultivated. These produce floral honeys and pollen as well as honeydew.

One of the major sources of honeydew is the European little-leaf lime (*Tilia cordata*). This yields honeydew from June through August. Other species known to produce honeydew include Japanese lime (*Tilia japonica*), white lime (*Tilia tomentosa*), and linden or common lime (*Tilia x europaea*).

American Liberty Elm

Honeydew from the large leaved lime (*Tilia platyphyllos*) is reportedly toxic to bees. This is collected in July and August.

Beech (*Fagus spp.*)

One species of beech, the American beech (*Fagus grandifolia*), is native to the East. In addition, the European beech (*Fagus sylvatica)* is grown as a landscape tree. These also yield pollen.

Black Locust (*Robinia pseudoacacia*)

Originally native to the Appalachian Mountains and the Ozarks, this is now widely cultivated in other areas. On average, this yields around 25 pounds of honeydew per colony.

Chestnut (*Castanea spp.*)

Various species of introduced chestnuts are widely cultivated. In addition to floral honey, they also yield honeydew, which can range in color from yellow to black. Ones known to yield honeydew include Spanish chestnut (*Castanea sativa*), and Japanese chestnut (*Castanea crenata*). Sometimes bees mix honeydew in with the regular honey.

Elm (*Ulmus spp.*)

Six species of elms are native to the East. There are also several introduced species that have also naturalized in some areas. The introduced elms are often grown as landscape plants. Though Dutch elm disease has become a serious problem, some new cultivars show disease resistance.

Hawthorn (*Crataegus spp.*)

These include trees and shrubs. Around 25 species are native to the U.S. Though hawthorns are most common in the eastern part of the country, quite a few are found in the West. In addition, a wide number of natural hybrids also exist in the wild. There are also many cultivated forms.

Hickory (*Carya spp.*)

Over 10 species are native to the East. These are major sources of honeydew. The trees also yield pollen.

Maples (*Acer spp.*)

Various maples are native to the U.S. There are also a number of introduced species in cultivation. These

Red Maple

can be trees or shrubs.

The species known to produce honeydew include the Norway maple (*Acer platanoides*), and tatarian maple (*Acer tataricum*). Sycamore maple (*Acer pseudoplatanus*) honeydew has a greenish tinge.

Oak (*Quercus spp.*)

Around 60 species are native to North America. They occur in all areas of the country. Some oaks yield nectar from extrafloral sources as well.

All of the oaks are major sources of honeydew. This is heavy bodied. The color can range from amber to dark amber. With a pleasing flavor, it has a sharp aroma and sweet, intense flavor.

The live oak (*Quercus virginiana*) is an important honeydew source. This can yield 25 pounds per colony. It is collected late in the season from August until frost, and is valuable during droughts.

The California white oak (*Quercus lobata*) yields honeydew. With a somewhat bitter flavor, this is generally considered inferior quality. It is mostly fed to the bees.

Poplar (*Populus spp.*)

This group includes the aspens. Over 10 species along with several natural hybrids occur in the U.S. They're found in all regions of the country, including Alaska. There are also cultivated forms as well. Most of the poplar species yield honeydew. The average yield is 25 pounds per colony.

Sycamore (*Platanus spp.*)

Three species of sycamore are native to the U.S. They're often found in the East. However, some occur in California and the Southwest. One hybrid, the London plane (*Platanus x acerifolia*) is also widely cultivated.

Tulip Poplar (*Liriodendron tulipifera*)

This species is native to the East. It is also widely cultivated as well.

Willow (*Salix spp.*)

These can be trees or shrubs. Over 75 species are native to North America, including all areas of the country. In addition, there are a number of cultivars as well as natural hybrids. White willow (*Salix alba*) and goat willow (*Salix caprea*) are two important sources of honeydew. These can yield 25 pounds per colony.

Flowers and Cultivated Crops

Various flowers and cultivated crops yield honeydew. The sunflower (*Helianthus annuus),* which is grown both as an ornamental and as a crop, is a reliable source. Honeydew is also gathered from the broad bean (*Vicia faba*). Alfalfa (*Medicago sativa*) is a

Sunflower 'Ring of Fire'

Sweet Corn 'Honey Select'

major source of honeydew. Red clover (*Trifolium pratense*) also yields honeydew. The Egyptian and long-staple types of cotton (*Gossypium spp.)* are good sources of honeydew. These are normally grown in the western U.S. under irrigation.

Corn (*Zea mays)* can yield pollen and honeydew. The honeydew is dark with a good flavor. At one time sugar cane (*Saccharum officinarum)* was a major source of honeydew in Hawaii.

Various kinds of small fruit plants yield honeydew. These include currants (*Ribes spp.*) and the brambles (*Rubus spp.),* including blackberry and raspberry. Honeydew is also collected from the leaves of grapes (*Vitis spp.).*

Several kinds of nut plants yield honeydew. These include the hazelnuts (*Corylus spp.).*

Honey bees sometimes collect honeydew from apple trees (*Malus pumila)* during the Summer for about a month. This also comes from other kinds of fruit trees.

Conifers

Conifers are major sources of honeydew. In general the honeydew is considered good quality. Species of conifers that are known to yield honeydew include the following.

Fir (*Abies spp.*)

Nearly 10 species of firs are native to North America, mostly in the West. They're also found in California and the Pacific Northwest. One occurs in the Appalachian Mountains. Fir honeydew comes from various insects.

Fir honeydew is usually green or brownish-black with green tinges. It has a thick, molasses-like body, and usually has a mild, sweet flavor. In some cases, it tastes more intense and medicinal-like.

In areas where fir forests are prevalent, the average yield is 90 pounds per colony though this can be much higher in some years.

Incense cedar (*Calocedrus decurrens*)

This species occurs in California and Oregon. The honeydew is amber to dark amber. With a heavy body, this is slow to granulate. It has a mild flavor.

Larch (*Larix spp.*)

These deciduous trees drop their leaves in the Fall. Three species of larches are native to North America. They're most common in the Northwest. The European larch (*Larix decidua*) is also widely cultivated.

These yield a thick bodied honeydew with a sharp flavor. Most larch honeydews become lighter colored over time. That derived from the European larch remains dark blackish-green.

Apple

Pine *(Pinus spp.*)

Over 30 pines are native to North America. They're common in all areas of the country. In addition, some introduced species are in cultivation.

In general the pine honeydews are excellent quality. In a few cases, this isn't suitable for table honey, and is used for medicinal purposes.

Various European pines have been introduced to the U.S. These are excellent sources of honeydew. The Scots or Scotch pine (*Pinus sylvestris),* and the Aleppo pine *(Pinus halepensis*) are two European species that are known to yield excellent quality honeydews. Their honeydew has a good body with a characteristic, pine-like flavor. It ranges in color from light amber to dark.

The Virginia or scrub pine (*Pinus virginiana*) is a major source in the East. This honeydew has a mild aroma and flavor reminiscent of pine. It is used as a table honey and for culinary/grilling purposes. This is generally excellent quality with the color varying from water white and amber to black. Large crops of pine honeydew are harvested in some areas, including the South, Mid-Atlantic, and Texas.

Redcedar (*Juniperus virginiana*)

When enough trees are available the bees will collect redcedar honeydew in some years. This is a common tree over much of the East. A related species, the southern redcedar (*Juniperus silicicola*), occurs along the coast of Texas. Both of these species are widely cultivated.

Spruce (*Picea spp.*)

In North America, there are several species of spruce. They generally prefer colder climates. These occur mostly in the North, the Rocky Mountains, and the Pacific Coast. In addition, the Norway spruce (*Picea abies),* an introduced species, is widely cultivated.

Spruce honeydew is generally considered a good quality honey. It comes in various colors, including red, brownish-red, and blackish-green. Slow to granulate, it is sweeter than some honeydews. BC

Connie Krochmal is an award winning garden writer and a beekeeper in Black Mountain, South Carolina.

Do We Have A PESTICIDE BLOWOUT

Clothianidin is agriculture's Deep Water Horizon. America's farmland is awash in questionable chemicals as surely as the shorelines of the Gulf Coast are awash in crude oil - and for many of the same reasons.

Tom Theobald

I doubt that there are many readers who have escaped reports of the oil well blowout - the explosion and collapse of the Deepwater Horizon drilling platform and the subsequent environmental disaster that has ensued.

Evidence is mounting that the blowout of the Deepwater Horizon was brought on by a climate of lax oversight by the federal agency responsible for *"insuring the safety and environmental protection of offshore drilling operations,"* the Mineral Management Service, or MMS. As I've listened to the news and read the articles describing events leading up to the explosion I'm struck by the parallel to what has been occurring in the beekeeping world over the past several years.

In May of 2008 there were massive bee kills in the Baden-Wurttemberg region of Germany, with two thirds of the colonies there killed. The damage was quickly traced to one of the pesticides in the controversial family of neonicotinoids produced by the German corporation Bayer. Planting of corn seed coated with clothianidin, by way of pneumatic planters, supposedly resulted in fugitive clothianidin dust which caused the disaster. Within two weeks Germany banned clothianidin on corn and several other crops, but the damage was done.

Clothianidin is just one of a number of pesticides in the family of neonicotinoids. Neonicotinoids are systemic pesticides, which means that they become incorporated into the system of the plant when the seed germinates. In the United States clothianidin was given a conditional registration by the EPA in 2003. Originally approved for use as a seed coating on corn and canola, it is now being approved for a growing list of other crops as well.

The German bee kill came as no surprise to the beekeeping community, which had been concerned about clothianidin since its registration in the U.S. in 2003, and in Germany in 2004. For four years those concerns were met with repeated assurances of safety, until finally disaster struck in Germany. Even in the aftermath of this huge bee kill the assurances continued. Bayer's explanation was that the bee kill was caused by *". . . an application error by the seed company which failed to use the glue-like substance that sticks the pesticide to the seed . . . It is an extremely rare event and has not been seen anywhere else in Europe . . ."* This is reminiscent of the finger pointing in the oil industry over the past several weeks.

It appears that two years later we have now had a repeat of this *"rare event,"* this time here in the United States. This bee kill occured in Indiana in April, reported by two entomologists at Purdue University in an article written for the Indiana Beekeepers Association newsletter and circulated widely. Titled "Pesticide Kill at the Purdue Bee Lab?" it reports a significant bee kill across Indiana, again believed to have come from fugitive dust from pneumatic corn planters.

According to these two entomologists *"Every corn seed that goes into the ground in Indiana these days has a coating of clothianidin on it. It has been a dry spring. We have had very warm, windy weather this week. As I watched my neighbor planting, I could see huge clouds of dust being stirred up."* As researchers at a major university, the authors had the resources to do some immediate analysis that would have been beyond the reach of most beekeepers, and they found high levels of clothianidin in the dead bees and the incoming pollen.

Along with other beekeepers, I have been concerned about clothianidin for some time, in part because it is not the first neonicotinoid to cause problems. Imidacloprid, the first, was registered in the U.S. in 1994 and was soon implicated in widespread bee kills. Several commercial beekeepers in North Dakota filed suit because of damage from imidacloprid used on sunflowers and similar damage in France from use on sunflowers led to a ban there in 1999. However it is still used without change in the U.S. France declined to even register clothianidin.

I became concerned about clothianidin in 2007 as the possible cause of a break in the Fall brood cycle I was seeing in my bees and in early 2008 I began digging into the facts surrounding its approval. That story is instructive and cause for great concern I believe.

The first record I found on the consideration of clothianidin comes in the form of an EPA memo dated February 23, 2003, titled "Risk Assessment for Seed Treatment of Corn and Canola." To their credit, EPA scientists raised serious concerns in that document and called for strong label language if clothianidin was to be approved for use. They cited the experience in France with imidacloprid as the basis for extreme caution and called for label language which would highlight the dangers. Quite responsibly, they called for a field test of the dangers *prior* to registration:

"The possibility of toxic exposure to nontarget pollinators through the translocation of clothianidin residues that result from seed treatment (corn and canola) has prompted EFED [Environmental Fate and Effects Division] *to require field testing that can evaluate the possible chronic exposure to honey bee larvae and queen. In order to fully evaluate the possibility of this toxic effect, a complete worker bee life cycle study must be conducted, as well as an evaluation of exposure and effects to the queen."*

and they called for strong label language as well:

"This compound is toxic to honey bees. The persistence of residues and the expression of clothianidin in nectar and pollen suggests the possibility of chronic toxic risk to honey bee larvae and the eventual stability of the hive."

This level of concern expressed by EPA scientists in February of 2003 wasn't to last however. In the next memo just two months later, dated April 10, 2003 - an Addendum to the Risk Assessment - EFED retreated. They stuck to their guns on the label language, sort of, but they appear to have been handed their heads by an EPA management that would brook no interference with corporate objectives. *"However, after further consideration ..."* is what the scientists had to say after having their attitudes adjusted:

"However, after further consideration, EFED would like to suggest that the registrant be given a conditional registration that is contingent on their conducting the chronic honey bee study that evaluates the sublethal effects of clothianidin over time. EFED will therefore defer the requirement for this bee labeling statement until after the chronic study has been reviewed."

Coast Guard photo

Bayer was given eight months, until December of 2003, to complete the study, but clothianidin was released to the market and the horses were out of the barn.

It is here, with the April memo, that the regulatory process begins to unravel. The condition of registration, the [chronic] life cycle field study, would go undone for years. *"After further consideration..."* meant that the real field test was to take place across the farmlands of America, without control and with serious concerns as to the safety of this pesticide unanswered.

The next memo, which established the final protocols for the field study, is dated March 11, 2004. The original deadline for the field study, upon which the conditional registration had been granted, had already passed three months before. Bayer requested and was granted, retroactively, an extension to complete the field study by May of 2005. All the while however clothianidin would be out on the market and useage would increase rapidly. This has become a common tactic in the corporate playbook, get these products out there by whatever means possible, get agriculture hooked, and then convince farmers they can't live without them.

Previously EPA scientists had clearly stated that any study should be done in the United States, but Bayer was given permission to do it in Canada instead. More significantly, rather than require that the field study be done on both crops, corn and canola, Bayer was allowed to test only canola, while corn was dismissed with a single sentence. This is significant because in the United States canola is a relatively minor crop, with less than a million acres grown. Corn on the other hand accounts for about 88 million acres. Further, we had just seen a decade of enormous damage to bees from a product called encapsulated methyl parathion, where contaminated corn pollen had been the major vector of damage and EPA scientists were well aware of this. I knew the biologist who signed off on the March, 2004 memo which dismissed corn so casually and he most certainly would have known of the dangers corn pollen could represent, yet Bayer was given a pass and was allowed to disregard corn.

Since clothianidin becomes part of the plant it is expressed in all parts of the plant, thus any insect which chews or sucks on the plant ingests the pesticide and dies. Don't worry though, we were told, it only affects the bad bugs. Besides, it's one of the new "green" pesticides, derived from a natural substance, nicotine (this is a whole other story, because like many other "green" pesticides it is a product of heavy chemistry, not nature). It also reduces the need for the application of other, supposedly more toxic pesticides we're told. Neonicotinoids have come under increasing criticism however, not the least of which has been leveled by the beekeeping industry and others for the alleged detrimental effects on honey bees and other pollinators.

The word "alleged" could start the fight I suppose, because critics believe the case against the neonicotinoids is complete and compelling. On the other hand, Bayer, and apparently the EPA, would have us believe otherwise. Much of the evidence is in the public arena now, and with the publication of this article, the conduct of the EPA, revealed through its own documents, will be as well. The readers can judge the evidence for themselves and draw their own conclusions. I'm presenting my view of the goings on and that can be part of your consideration. Obviously, I'm not without my own opinions in these matters.

The official life cycle study was to languish for years. In March of 2004 the initial deadline for the study had passed and the EPA granted Bayer an extension, until May of 2005, allowing further that if accurate data could not be produced in the summer of 2004, the study might be extended yet again, through the 2005 growing season. According to its own records, dated March 11, 2004, the

EPA says "*EFED wants usable data to decide the potential adverse effects to bees from clothianidin's seed treatment use and opposes rushing the study and having deficient information.*"

While this may seem to evidence concern, you must remember that this would mean a pesticide with serious questions as to its environmental consequences could then have been on the market and in wide use for three full growing seasons without any answers to those questions. While there may have been concern about rushing the study, there seemed to be no comparable concern about rushing an untested pesticide onto the market. These tests should have been completed before clothianidin was ever registered, as EPA scientists had initially recommended.

Then in May of 2008 we have the German incident – two thirds of the colonies in the Baden-Wurttemberg region killed, with 99% of the dead bees showing high levels of clothianidin. Within two weeks of this incident Germany had suspended the registration for clothianidin and this action was soon followed by bans in Italy and Slovenia. And what came from regulators in the U.S.? Silence. Worse than silence actually, because it soon began to appear that the EPA was going into hiding.

It was in the Spring of 2008, before the German incident, that I began investigating clothianidin. I did so because the previous Fall I had discovered that there was a break in the Fall brood cycle in nearly all of my colonies, and when I tried to match the symptoms to some known or suspected cause, the trail led to clothianidin.

I wasn't the only one who was concerned about pesticides. In the Fall of 2006 Pennsylvania beekeeper David Hackenberg had broken the story of huge bee losses, what would come to be called Colony Collapse Disorder, or CCD. Dubbed the great mystery by many researchers, over time more and more beekeepers began to believe that there was little mystery and that pesticides were a major ingredient in CCD.

The Natural Resources Defense Council had begun questioning the safety of clothianidin and subsequent to the incident in Germany asked the EPA to provide the long awaited life cycle study, which was by now four years overdue. The EPA failed to respond so the NRDC filed a Freedom of Information Act request. The EPA failed to respond once more and on August 18, 2008 the NRDC filed suit for the study.

It was just prior to the NRDC suit that I discovered the infamous missing study; the internet can be an amazing resource if you just keep digging and prying. Within a month of my discovery the EPA had put their review and approval of the study on their web site, apparently flushed out by the NRDC lawsuit. What the review does and doesn't reveal is disturbing.

Let me first put the study in a more agricultural context, and then look at it more closely. Let's say you had a noxious weed that was affecting your cattle and you wanted to assess the dangers. So you plant two and a half acres of the suspect weed in the middle of 2000 acres of lush Wyoming grassland and put four cows on the test plot. The cows aren't fenced in, however, and are free to roam over the entire 2000 acres. What do you think is going to happen? How long do you think your four cows are going to stay on your dinky little test plot? How significantly is that noxious weed going to be represented in their diet? I think you know the answers.

Here's what the life cycle study of bees and canola consisted of: four colonies of bees were set in the middle of one hectare (2½ acres) of canola planted from treated seed, with the bees free to forage over thousands of surrounding acres in bloom with untreated canola, which they most surely did. What do you think the results were? They were exactly what Bayer wanted of course.

Why was the chronic life cycle study and the EPA's review unavailable? Was it ineptitude? Perhaps it was simply embarrassment, because the study had been completed on August 1, 2006, already long overdue, and yet despite all the controversy had not been reviewed by the EPA until November 16, 2007, nearly a year and a half later, after clothianidin had been on the market for five full growing seasons.

Perhaps it was because in the opening paragraph of its review the EPA states unequivocally *"This study is scientifically sound and satisfies the guideline requirements for a field toxicity test with honeybees (OPP Gdln. No. 141-5; OPPTS 850.3040)."* Scientifically sound? If you're in 4th grade perhaps, but certainly not if you have a Phd after your name. They should be embarrassed, this makes a mockery of science.

Further concerns are emerging as a consequence of the Indiana bee kill. High levels of atrazine were found in the dead bees and pollen along with clothianidin. This suggests that dust alone may be a vector, with the atrazine contamination coming from airborn soil. We now find evidence, again from the EPA's own documents, that clothianidin can be persistent in the soil, remaning for years in some cases, and that it may accumulate from successive uses of treated seed, a common practice in the corn belt. Has the soil itself become a source of toxicity as a consequence of clothianidin use? Only further tests will give us answers to those questions.

What are we to do with circumstances like these? It is simply nuts, and yet this bogus science has now been

Since clothianidin becomes part of the plant it is expressed in all parts of the plant, thus any insect which chews or sucks on the plant ingests the pesticide and dies. Don't worry though, we were told, it only affects the bad bugs.

used as justification to approve the use of clothianidin on a rapidly growing roster of other crops while there is mounting evidence of problems coming from around the globe. The EPA still seems to lack any sense of urgency and says it will not review clothianidin until 2012.

I still believe that most of the working level people at the EPA want to do things right, but there seems to be a serious management failure and nobody seems to be stepping in to get the ship back on course. Some very spooky chemicals are coming onto the market without proper testing and once out are virtually unregulated. We are seeing the legacy of more than a decade of deregulation and self regulation and it has not worked.

This is the Deepwater Horizon in agriculture. America's farmland is awash in these questionable chemicals as surely as the shorelines of the Gulf Coast are awash in crude oil, and for many of the same reasons.

The bees are telling us something. We need to start listening before it's too late. BC

Tom Theobald is a sideline beekeeper & activist in Niwot, CO.

We now find evidence, again from the EPA's own documents, that clothianidin can be persistent in the soil, remaining for years in some cases, and that it may accumulate from successive uses of treated seed, a common practice in the corn belt.

GLEANINGS

OBITUARY

The beekeeping industry has lost one of its greatest supporters. Willy Baumgartner, founder of Medivet Pharmaceuticals Ltd. and developer of the improved Fumagilin-B medicine for honey bees, died May 18 after a lengthy illness. Willy was 82 years old. Willy Baumgartner was a Swiss-educated chemist who immigrated into Canada when he was in his 20s. After a successful career in Ontario with a pharmaceutical company, Willy moved west to Calgary in 1980. He established Medivet - an enterprise making a variety of veterinary medicines mostly for cattle and horses. Soon his High River, Alberta, company began to specialize in pharmaceuticals for honey bees.

One of his first achievements was improving oxytetracyclines so they would maintain their efficacy in the rather alkali water common on the western prairies. He worked out dosages, reminding beekeepers that "a hivetool is not a measuring device." Willy Baumgartner's greatest pharmaceutical accomplishment was improving the delivery of fumagillin products for honey bees. Developed by Abbott Laboratories researchers in the early 1950s as a medicine for people, it was found to be more effective as a honey bee treatment against nosema. But the material clumped in water, wasn't stable for long, and was difficult to deliver to honey bees in the right dosage. Willy solved these issues, creating Fumagilin-B and making it available at an affordable price to beekeepers. The medicine is the only effective treatment against nosema, which has been widely implicated as a leading cause of colony collapse disorder. It can be said that Willy's work has saved the lives of hundreds of millions of honey bees around the world.

A tireless innovator, he developed machines and methods to safely distribute oxalic acid into hives to fight mites, regimes for safe tetracycline and fumagillin treatments, and procedures for proper pharmaceutical use in beehives.

Willy Baumgartner was a warm and generous person; a friend to all who knew him. He was a keen traveler, champion Jass player, skier, shooter, amateur actor, and great supporter of the Swiss cultural Society. He will be greatly missed by all who knew him.

CCD CAUSE FOUND?

U.S. Department of Agriculture researchers say they have found a potential cause for colony collapse disorder in honeybees – a group of pathogens including a fungus and family of viruses may be working together to cause the decline.

The scientists reported their results May 24 at the 110th General Meeting of the American Society for Microbiology in San Diego.

"There might be a synergism between two very different pathogens," USDA Agricultural Research Service researcher Jay Evans says. "When they show up together, there is a significant correlation with colony decline."

"Domesticated honey bees face numerous pests and pathogens, tempting hypotheses that colony collapses arise from exposure to new or resurgent pathogens."

To better understand the cause of these collapses, in early 2007 Evans and his colleagues collected bees from both healthy and declining colonies across the country but primarily from California and Florida where most of the commercial pollination activity takes place.

They have screened these samples and similar samples from each year since then for both known and novel pathogens.

They found a slightly higher incidence of a fungal pathogen known as Nosema ceranae in sick colonies, but it was not statistically significant until they began pairing it with other pathogens.

"Levels of the fungus were slightly higher in sick colonies, but the presence of that fungus and 2 or 3 RNA viruses from the family Dicistroviridae is a pretty strong predictor of collapse," Evans says.

Nosema are transferred between bees via the fecal-oral route. When a bee initially ingests the microbes and they get to the mid-gut, they harpoon themselves into the gut wall and live inside the epithelial cells there.

Evans believes the slightly higher numbers of the fungus somehow compromise the gut wall and allow the viruses to overwhelm the bees. In colonies with higher Nosema numbers they found virus levels to be two to three times greater than healthy colonies.

While this is a working theory and they are still in the discovery phase looking for new pathogens, Evans and his colleagues are also actively looking for a way to boost bee defenses against Nosema.

"A way to protect against Nosema might be the key for now," he says.

Alan Harman

OBITUARY

Ted Hooper was a former president of the British Beekeepers' Association and the influential author of *Guide to Bees and Honey* and, with Roger Morse, *The Illustrated Encyclopedia of Beekeeping*. The Guide has sold more than 100,000 copies and been translated into more than 12 languages since publication in 1976. A fourth edition will appear shortly, updated by one of his pupils, and will include techniques to control *varroasis* – a condition unknown to Hooper before his official retirement in 1984. It is still a highly recommended book for new beekeepers.

And They're Looking For Tropilaelaps Mites

USDA APHIS TAKING SURVEY

The U.S. Department of Agriculture launches a 13-state survey of honey bee pests and diseases to help USDA scientists determine the prevalence of parasites and disease-causing microorganisms that may be contributing to the decline of honey bee colonies nationwide.

The survey will take place in Alabama, California, Georgia, Indiana, Florida, Hawaii, Michigan, New York, Pennsylvania, South Dakota, Tennessee, Texas and Washington.

It is being conducted by USDA's Animal and Plant Health Inspection Service (APHIS), USDA's Agricultural Research Service (ARS) and Pennsylvania State University (PSU).

Agriculture Secretary Tom Vilsack says bee health is critical for the success of pollination-based agriculture, which produces about a third of the food in the U.S.

"There has been a disturbing drop in the number of U.S. bee colonies over the last few years, while the demand for commercial bee pollination services continues to grow," he says. "This survey will help us to better understand the factors threatening our honey bees so we can take effective action to protect them and the crops that they pollinate."

The voluntary survey includes 350 apiaries across 13 states and will last through the end of the year. APHIS developed the survey protocol jointly with ARS and PSU and allocated $550,000.

Survey kits have been mailed to state apiary specialists, who will collect samples of bees and debris from the apiaries in their states. ARS and PSU scientists will test the samples for specific pests and pathogens. APHIS is particularly interested to know whether foreign mites of the genus Tropilaelaps have entered the U.S. – *Alan Harman*

HONEY & KIDS

The National Honey Board has revamped its educational materials for children, creating a fresh look and feel to excite children about using honey. The two brochures, one educational and one recipe-based, are available for free (in limited quantities) to interested members or associations in the honey industry.

The educational brochure, *A Sweet Story: The Making of Honey*, describes how honey is made and includes a game and a quick and simple recipe. This fun and lighthearted brochure is primarily geared toward children nine to 12 years old, but is suitable for younger children as well.

The children's recipe brochure, From Honey Bees to Brain Freeze, is a kid's ultimate guide to cooking with honey. From snacks to dinner to dessert, this brochure provides plenty of easy-to-follow recipes that are delicious and fun to make.

If any honey industry member or association is interested in obtaining copies of these brochures, please email Andrea Brening at andrea@nhb.org, or call 303.776.2337. For more information on the National Honey Board, please visit www.honey.com, follow us on Twitter (Twitter) or become a fan on Facebook (Facebook).

PESTICIDE/POLLINATOR SIMULCAST SYMPOSIUM

Sponsored by Alfred State SUNY College of Technology/Institute for Sustainability, The Western New York Honey Producers Association, The New York Sustainable Agriculture Working Group, and *Bee Culture* - the magazine of American beekeeping – July 22, 10:00 - 11:30 a.m., 1:00 - 4:00 p.m. Alfred State SUNY College of Technology, 10 Upper College Drive, Alfred, NY.

A steady decline in pollinator species has been noted for decades. Additionally, the increasing loss of honey bee colonies suffered by the commercial beekeepers that provide pollination services to commercial growers indicates that many food supplies are imperiled. This symposium introduces attendees to some of the recent findings related to honey bee and pollinator losses.

Presenting from Penn State University/Center for Pollinator Research: Maryann Frazier, PA State Extension Entomologist - A survey of recent research findings regarding honey bee health. Dr. James Frazier, Professor, Department of Entomology - Synergistic and sublethal effects of pesticides on honey bees.

Presenting live via video from the USDA-ARS Honey Bee Pollination Lab in Tucson, Arizona: Dr. Gloria DeGrandi-Hoffman, Research Director - Do pesticide contaminants alter the microflora in healthy honey bee colonies? Dr. Diana Sammataro - Beneficial lactic acid bacteria microflora of honey bees. Dr. Kirk Anderson - Microbiota in the stored food sources of social insects. Dr. Mark Carroll - *Varroa* mite attractants; potential solution for *Varroa* mite-/viral challenges to honey bees.

There is no cost to attend, however pre-registration is required through the New York Sustainable Agriculture Working Group at the following email - nysawg@gmail.com or at 716.316.5839. Include name, afficiliation (eg. grower, researcher/college, beekeeper/organization, etc.) and phone # or email address.

For those wishing to bring a picnic lunch, a designated area will be announced at the meeting.

FLORIDA BEEKEEPER ACCUSED OF THEFT

A Florida beekeeper was being held on $50,000 b0nd after being arrested on charges of stealing bee hives, honey and honey-making equipment from businesses in St. Johns County.

Ruben Josey, 45, owner of Josey's Honey Farm in Crescent City and vice president of the Beekeepers of Putnam County, was charged with two counts of dealing in stolen property.

The Palatka Daily News reports officers from the St. Johns County Sheriff's Office recovered 48 beehives and related goods that had been reported stolen from two beekeepers in December and January.

Sheriff's spokesman Lt. Johnny Greenwood says other hives and stolen property from Putnam and neighboring counties may also be involved.

Putnam County beekeeper Nancy Gentry, a member of the Beekeepers of Putnam County, tells the newspaper she and other local beekeepers had been trying to gather information due to rising suspicions.

"We are pleased to see Mr. Josey has been arrested," she says. "The number of beekeepers that have been affected . . . increase every day. There was a considerable amount of honey discovered still in the honey boxes and it looks as though those were stolen from beekeepers in Georgia, so this just keeps getting bigger and bigger."

Each hive contains registration numbers that are listed with the state. – *Alan Harman*

PITTSBURGH GETS BEES

Beekeepers say it's only natural that Pittsburgh is home to the first community apiary in the United States – the bees wear the colors of the NFL Pittsburgh Steelers.

The apiary, an entirely new model for the U.S, is located on a strip of long-vacant land and was opened with a ribbon cutting ceremony after the Burgh Bees group won a free, five-year lease from the city's Urban Development Authority and th4e city council.

The community apiary allows city dwellers without yards to keep hives of their own.

The once a vacant half-acre is planted with native flowers and is home to about a dozen hives.

Burgh Bees co-founder Meredith Meyer Grelli tells reporters the group wanted to come up with a site that inspires creative reuse of the urban land with an eye toward the environment.

"This is going to be a great site for beekeepers and also a great place for the community," he says.

The apiary has five hives exclusively for teaching new beekeepers and offers space to newly trained beekeepers to keep hives of their own. There is a pollinator garden maintained by community volunteers.

It is being funded with donations and by the sale of honey.

Burgh Bees, founded in 2008 with the mission of promoting bees and beekeeping in Pittsburgh, has trained more than 100 people beekeeping and now has some 400 members.

It had previously set up four demonstration apiaries in urban neighborhoods, working with urban farming organizations and the Pittsburgh Zoo. – *Alan Harman*

HONEY BEE BED & BREAKFAST

If USDA and the Xerces Society have their way, long rows of native wildflowers, clovers and blooming shrubs could border agricultural fields all across California. Currently the concept is in full bloom at USDA's Plant Materials Center (PMC) near Lockeford, California, where the partners hope to demonstrate to farmers and the public both the beauty and the practical benefits of planting forbs such as California poppies, lupines, baby blue eyes, clovers and other flowering plants on the edges of fields, orchards or vineyards.

"It's no secret that honey bees have been having a hard time lately," says Mace Vaughan, Pollinator Program Director for Xerces. "Native bees can work alongside the domesticated honey bees to pollinate the cornucopia of fruits, vegetables and nuts grown in California. Having flowers blooming from February to November will provide food and habitat for native pollinators honey bees alike."

California leads the Nation in adopting the practice of field-side hedgerows and last year accounted for half of all those developed in the U.S. In 2009, USDA's Natural Resources Conservation Service (NRCS) and farmers developed 57 miles of hedgerows – enough to string these colorful "bed and breakfasts for pollinators" from Merced to Fresno.

Margaret Smither-Kopperl, the newly-hired manager of the PMC, is originally from England. While California farmers are leading the adoption curve in the U.S., Smither-Kopperl says that hedgerows have been common in England for hundreds, sometimes thousands of years. While originally serving as a type of fencing, they also host wildlife and pollinators and include berries and medicinal plants. "You can even date the age of the hedges by the number of species they host," she says.

U.S. farmers in California and elsewhere have been using hedgerows planted with native species for more than a decade now in order to provide habitat for beneficial insects that can help control crop pests. Thomas Moore, state biologist with USDA's Natural Resources Conservation Service, says that incorporating forbs into the hedgerow mix can create dense plantings that can outcompete field-bordering weeds, while supporting pest management and pollination.

NRCS and Xerces, a non-profit looking out for the well being of invertebrates, are working to design mixes of species that they hope will be grown at NRCS Plant Materials Centers across the Nation. "Our hope is to develop easy-to-follow prescriptions of species that farmers and ranchers could adapt for their specific needs," says Moore.

Several Resource Conservation Districts and other partners throughout the state are working with NRCS and Xerces to demonstrate how hedgerows are beneficial for different crops and locations throughout California. The NRCS can share the cost of building hedgerows for eligible farmers and ranchers. Field offices statewide can provide more information or go to www.ca.nrcs.usda.gov. To view a short YouTube video on California pollinators, go to **http://www.youtube.com/watch?v=P0hyih9TBq8**.

Joy

Who could need more proof than honey –
How the bees with such skill and purpose
enter flower after flower
sing their way home
to create and cap the new honey
just to get through the flowerless winter.

And how the bear with intention and cunning
raids the hive
shovels pawful after pawful into his happy mouth
bats away indignant bees
stumbles off in a stupor of satiation and stickiness.

And how we humans can't resist its viscosity
its taste of clover and wind
its metaphorical power:
don't we yearn for a land of milk and honey?
don't we call our loved ones "honey?"

all because bees just do, over and over again, what they were made to do.

Oh, who could need more proof than honey
to know that our world
was meant to be and was meant to be sweet?

by Julie Cadwallader Staub

I Am Queen

I have been appointed, anointed, elected, and bred for my post. I am queen. My drones, drawn by my pheromones, attend my every need, dote on me, float on me, feed me, exalt in my fertility. I am queen. I do nothing all day. But lay.

My scent drives my drones, my proles, to their knees and they appease me. And I lay. A phalanx of workers gathers my sustenance and genuflects at my door, proffering sweets and treats to my bores on trays of sculptured wax, for delivery to me. Squirming and worming their way, over and under the hive, alive, the drones, the doers, the poors, lift up my tray, and I extend my tongue and drink. And I lay.

And then one day – the roof is lifted from my world. I see stars and Mars and a spaceman, dressed in white. I stare at his veil with my compound eyes, and in the dusk I breathe his musk. And I lay, still.

He searches and lurches, finding me, minding me, hustles me, muscles me into his palm. My antennae caress his skin, and I win – a new life, as his wife.

But no. In his hand, a cage. And I gauge it to be the one I came in. When I was new and driven to lay. Two compound eyes, and three small, too, gaze down on me with disdain and I shrink with pain. My spaceman sets her, lets her, dangle from my favourite frame. He rushes me, brushes me aside and a cloud drifts by overhead. I cry. And I'll die.

But I was queen.

by Judy Mayhew

Honey For Breakfast

After breakfast, I was planting
lantana in red clay.
I dug a hole in the side of the hill
to amend the clay, I reached
under the juniper, green and lacy,
for a handful of brown leaves –
maple, oak, pricking holly –
to aerate the roots, compact in
a black plastic pot of soil.
I did not know that the leaves
were a hive; bees, tiny – twelve
millimeters long – with orange
stripes on their posterior abdomen,
blew up. I had invaded their work,
charming nectar into honey-pleasure.

When they realized I was vinegar,
the sentinels of the hive besieged
me; lusty females buzzed
in silence in their act of revenge.
Like suicide bombers, they
swarmed me, knowing the release of
such venom would be their end.
They drilled five holes into my hands –
through blue gloves – and
one into each bare ankle, a stinger
jutting from the right like
a dagger from the heart.

After noon, peace claimed the hill;
the bees had returned to their
mysterious routine under the leaves.
I buried the lantana roots in
leaf-mulched clay. It bloomed royal pink
shaded in orange, each flower a
bouquet of tiny blossoms to
lure the bee-gatherers to linger near
and drink its juice.

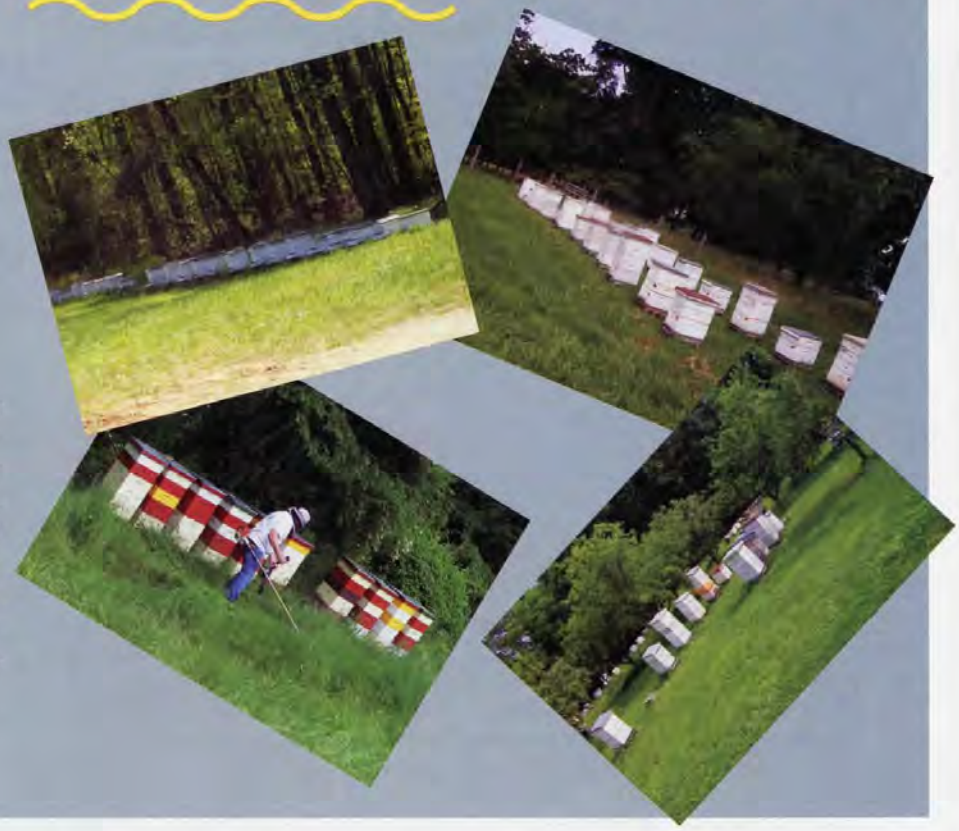
After many days, when the lantana has
grown four feet tall and the bee-workers
have drawn its sugar and
retreated to the hive,
I shall have honey for breakfast.

by Jo Barbara Taylor

2011 CALENDAR PHOTO CONTEST

Show Me Your Beeyard

Deadline for submissions for *Bee Culture's* 2011 Beekeeping Calendar is October 1, 2010 in our office. So mark your calendars now (oh look it's already marked on your 2010 *Bee Culture* Calendar) and get going! See **www.BeeCulture.com** for all the how-to details, but don't delay. Take those beeyard photos today.



Display Advertisers

What Could Go Wrong?

Ed Colby

One great thing about working on the ski patrol is that I can double dip. Mountain employees and savvy locals know there's honey in my cubby at the mountaintop patrol headquarters.

One fine Spring day I was at the bottom of the hill where I keep my main honey cache. It occurred to me that the honey cupboard on top was bare. I didn't have a backpack, but I grabbed three glass quarts, anyway. I tucked one inside the front of my patrol vest and cradled one under each arm. I'd done this before, and with this kind of advertising, sometimes I can make a sale to a lift operator on the way up.

It's only three short lift rides to the top, and it was a slow day. What could go wrong?

As I was about to get off the second chair, I spied a young woman struggling to ski down, so I skied down to offer help. I explained that this is an expert ski mountain. There's no easy way down. When I suggested a sled ride to the bottom, she conceded that that might be a good idea.

I made a radio call, and when Ricky arrived, I took the handles. "Hey, would you mind running these honey jars to the top?" I said. "I'll buy you a beer."

I still had the jar in my vest.

I tied the young woman's skis onto the sled and told her to sit on top of the Stokes litter and hold on with both hands.

She was just as terrified of her sled ride as she was of skiing down, although I always thought I was a pretty good driver. I don't know how I could have given her a smoother ride, but she shrieked the whole way.

En route, my radio squawked that someone had hit a power transformer on the same run I was descending. I said I'd check it out.

I stopped maybe 20 feet above the transformer. It sat adjacent to a rail fence surrounding a deck on a building occupied by the ski hill maintenance man, and, significantly, his dog.

But there was nobody around. I radioed back that this was an apparent false alarm. When I finished talking, I heard a faint voice. "Over here!"

I skied right to the transformer, and lo and behold, there was a seven-foot sun-melt hole in front of it. Both the transformer and the hole were marked by a line of bamboo poles uphill of them. Inside the hole, reclining back at a 60° angle, was a man holding his arm. One of his detached skis was stuck in the fence above the hole.

He said he hit his elbow and that he had no feeling in his hand.

I immediately jumped into the hole with him and radioed for help. The young woman who had been riding on my sled peered down into the hole at us and said, "I think I can make it down on my own."

"Tony" was pretty good natured about his predicament. Not everybody would be.

As I was splinting his arm and putting it into a sling, I detected an unmistakable odor. The hole was full of dog droppings! I said, "Tony, do you realize we're at the bottom of a hole full of dog doo?"

"I hadn't noticed," he said with a wry smile.

After help arrived, I told Tony he'd have to kick steps and climb out of the hole, although we'd help. As he struggled to get out, I said to Bethany, "Grab his good arm!" But she just stood there.

Afterwards, I asked her, "Why didn't you pull on his arm!?"

"It had dog doo on it," she said.

She could be such a prima donna!

After we had Tony loaded into the toboggan, I leaned over to secure a strap, and that quart of honey squirted out of my vest pocket and began rolling and tumbling down the steep, icy slope at an alarming rate of speed!

"Uh-oh!" I exclaimed. In my mind's eye, I saw that three-pound glass jar either exploding, or worse yet, bouncing and rolling all the way into town.

Max, who is young, and skis better than I ever did, already had his skis on. "I'll get it!" he cried, and in a flash he swooped below the jar and fielded it like a hot grounder.

Of course the whole adventure became the talk of the patrol room. This story had it all – the terrified toboggan rider, the patient I couldn't find, the hole, the ski stuck in the fence, the numb hand, the dog droppings, the maintenance man and his dog, the prima donna patroller who wouldn't touch the patient. The honey jar was just the icing on the cake of a story with an ultimately happy ending – Tony's elbow wasn't seriously injured – apparently he only took an enormous whack to his funny bone.

The other good ending to the story is that my boss has a sense of humor. He had every right to read me the riot act for unleashing a potentially deadly weapon on the ski slopes, and he certainly has no obligation to let me use the ski hill as a honey outlet. But all he did was chuckle.

BOTTOM BOARD