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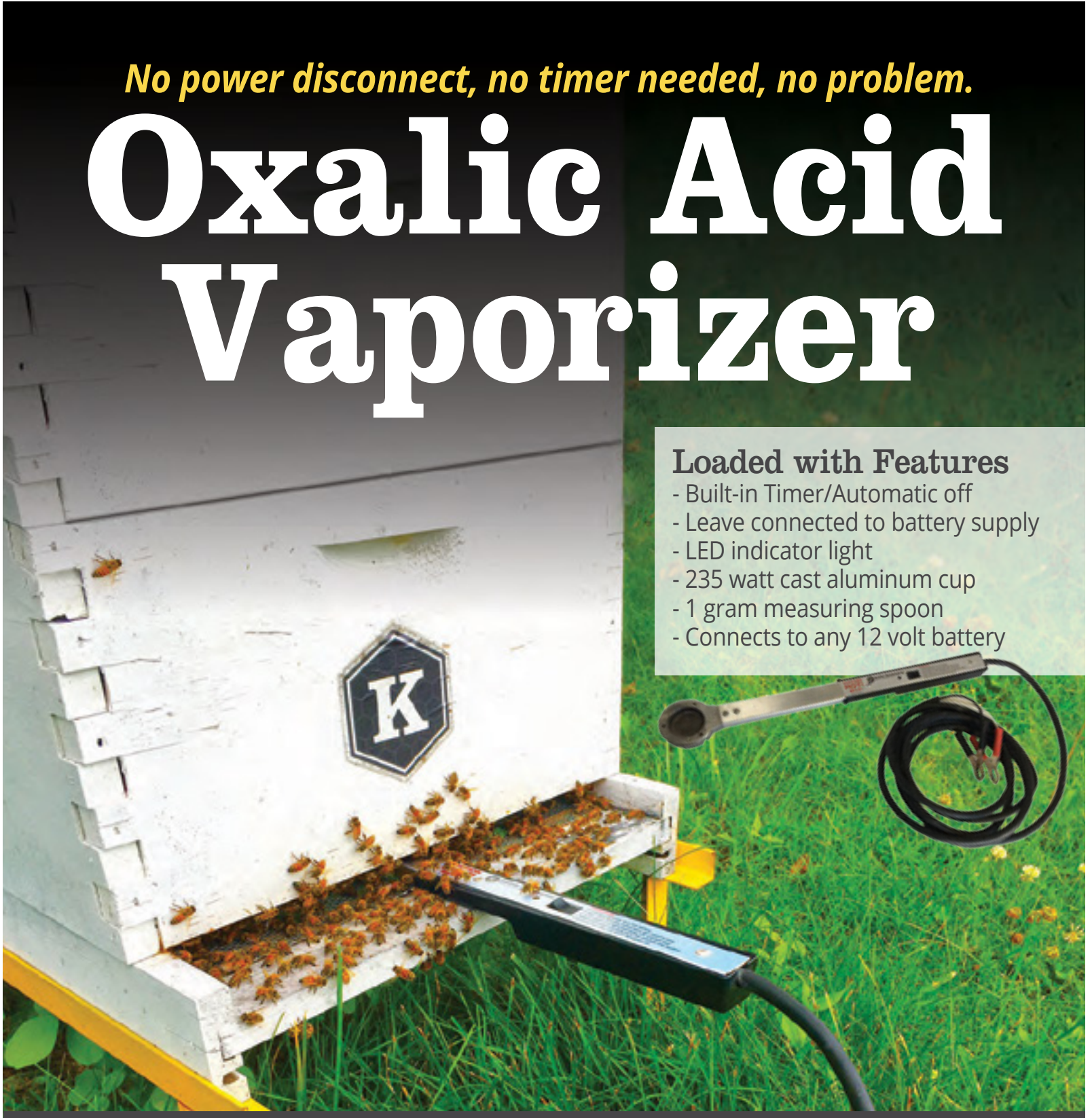

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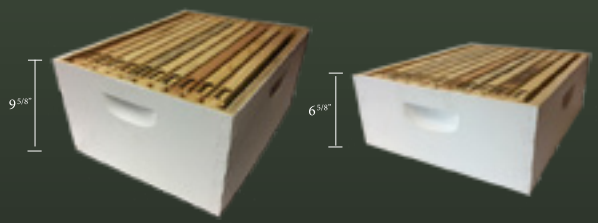

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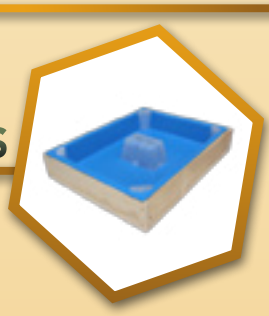

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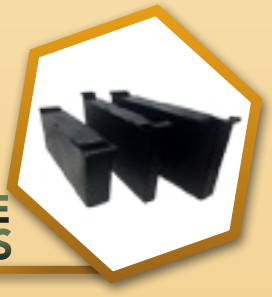

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Bee Culture

September Features . . .

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One of the few photos of A.I. with bees.

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L. L. Langstroth and A. I. Root discuss old times
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L. L. Langstroth talks about My Hive
A. I. Root talks about the beginnings of the beekeeping industry
Wyatt Mangum displays and discusses early beekeeping equipment
Tammy Horn Potter looks at the history of women in Beekeeping
Jerry Hayes looks at the history of the industry organizations, groups, movements
Gabe Dadant talks about the history of the Dadant Company
Jim Thompson discusses equipment from his extensive collections
Malcolm Sanford discusses the history of Apiculture Research specifically in Ohio
Kim Flottum C.P. Dadant
Ellen Tuper
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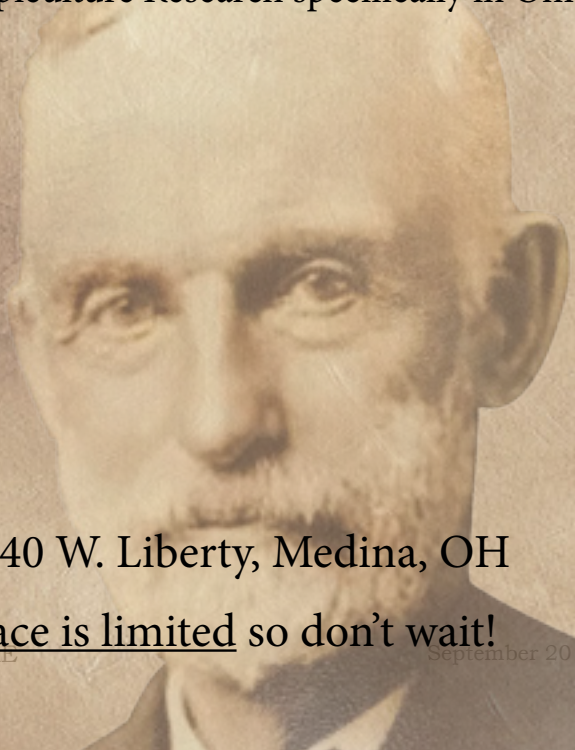

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Join us in the conference room at 640 W. Liberty, Medina, OH

Registration begins May 1 and space is limited so don't wait!

Bee Culture's Best . . .

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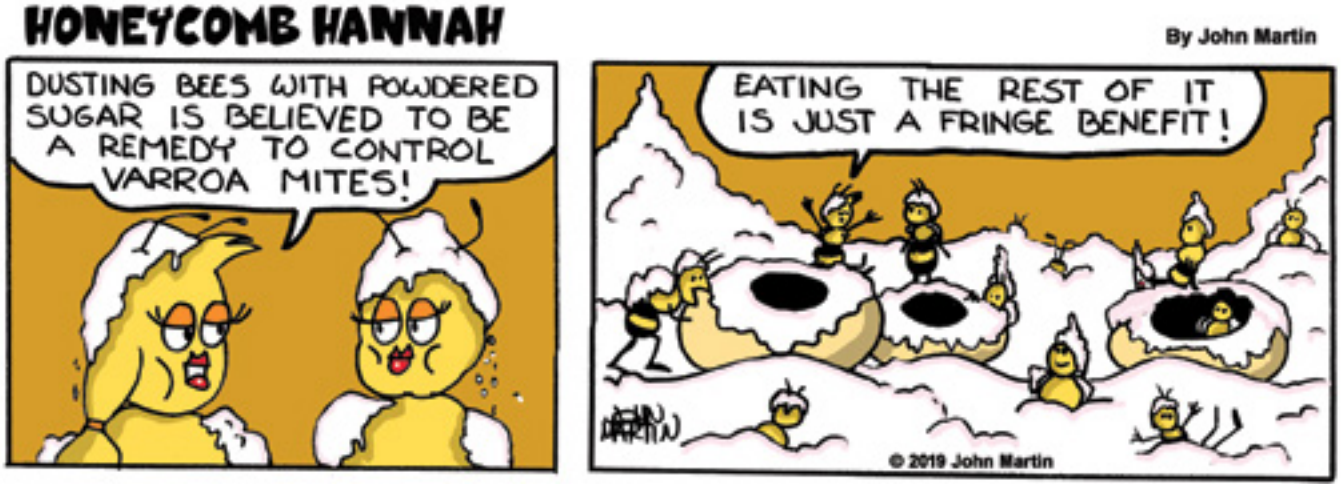
In Every Month –



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Excellent Article

Ed Colby's short article, *And There are Angels* was very heart-warming. Thank you for including this. Readers, including myself, need to hear these real-life stories.

Bruce Snavely
Republic, MO

CATCH THE BUZZ

Regarding – So, You Want A Piece Of The Other Side Of All That Almond Pollination Money? Consider Owning A Piece Of The Pie, So To Speak. Invest In An Almond Orchard. Thanks for bringing information like this to our attention.

I offer one suggestion. It appears that this project is worthwhile. However, I believe some cautionary notes are in order.

The site referenced in the article does not have any protections apparent in its web site.

Most reputable organizations are backed by organizations such as the SIPC Securities Investor Protection Corporation. There are some organizations that do not offer such protections for investors. Witness the problems in the Madoff debacle. REIT's come in many forms, but as a legal identity I strongly urge you to make mention of this in order to protect not only the interests of potential investors in farmland like this but also your own interests should the average reader not understand the need for such protections.

Thank you for making information available on beekeeping and agriculture in general.

Stephen Bamford
Seattle, WA

Thanks to Bee Culture

Being new to bees, *Bee Culture* Magazine, and the beekeeping world, taking up the study just a few months ago. It has been six now, having spent around $200 in books, studying about bees. I believe in about two years I will have gleaned enough knowledge to invest a few more dollars into some equipment and packages.

I would like to thank you for your magazine and would like to congratulate David MacFawn on his article, *Smokers!* In the June issue. Everyone I know that has been "stung by the bee" has been talking about it. Do you have anymore information on the research of Frank Eischen with the USDA's Agricultural Research Service?

It all sounds very promising. I will remember that I read about it in *Bee Culture* first.

Michael Mahaffey
Enoree, SC

Art of Selling Honey

On the march from a few to one hundred hives your beekeeping practices change. You throw away the queen excluder. Medicating for diseases becomes critical. You migate from spinning a few frames by hand to motorized equipment. Selling also becomes more important. Selling beer at my family's bar was quite different than selling computers for large corporations. After 45 years of selling honey I have learned a few things.

Customers will get discouraged if you can't supply them year

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round. A crisp memorable label is important. If your honey crystalizes too quickly your business will suffer. I wear a bee hat at farmer's markets to be memorable. I often bring an observation hive to educate and entertain. No one that sells for me at farmer's markets is allowed to sit in a chair. Standing, greeting customers with your eyes and smiling sells honey. Having many derivative products creates interest. I sell cream, comb, light honey, dark honey, flavored honey, mead, educational posters and Balsamic & Honey Concentrate. I create a situation in which it is not whether you buy something but what you will buy.

The Balsamic & Honey Concentrate is a great interest starter. I display eleven recipes such as using the Concentrate as a simple marinade to a drizzle for a bruscheta and as a flavoring for quinoa. I have sold thousands of Concentrates and it keeps people coming back sooner than if they were just looking for a jar of honey.

If you do it right the Ph is low making it safe and shelf stable. You can use an ordinary less expensive balsamic and readily available spices. Both honey and balsamic are acidic. The honey cuts the vinegar and the vinegar cuts the sweetness of the honey. Books are written extolling the virtues of consuming honey and vinegar.

I started mixing the ingredients and filling containers by hand. My sales quickly outgrew the initial manual process. Now I speed the process by a mixing propeller, a large stainless tank and a semi automated filling system.

I have watched my business morph from a few hives delivering honey to one farm stand... now I deliver to 15 stores and do five farmer's markets. The techniques to manage a few hives to now over one hundred hives has evolved. I have changed my extracting systems multiple times. Years ago I developed a poster that I sell around the world. I sell hives to newcomers. I do school programs. I remove hives from people's homes. As my business expanded my selling approach has needed to improve. At whatever level you are at now, I encourage you to add Balsamic & Honey to your offering.

Rick Green
New York

Calendar Contest 2020

2020 – HONEY!

Everything from a forager and flower, uncapped nectar, capped honey, harvesting honey, uncapping and extracting honey, bottling honey and the final product – a bottle of honey with your label. Frames of honey, honey houses, uncapping, extracting, bottling, spills, anything and everything honey.

Look at the shape of the photo on each page. Not quite square, certainly not vertical. We lose excellent vertical photos every year because we simply can't use them. Think of what your photo will look like when framing it with your camera. Then turn your camera 90 degrees and look again.

Have your shot in either full sun, or full shade, but not both. Your camera won't like what it sees and won't do a good job of lighting.

Horizontal shots will do OK but keep the width:height ratio somewhat in mind. If the subject is too wide, then to get it all in back ground – but maybe that's ok this time. Have the subject – this time Honey, Everything And Anything Honey – close enough that we can see the details. We want light honey, dark honey, bubbles, foam, everything you encounter when harvesting honey.

Take lots of shots. Slightly different angles both left and right and up and down. Fuzz down your flash with tissue or partially block it so the light isn't crisp. If you can, reduce the intensity of the flash, too. Put a piece of paper over it, or hold your finger over part of the lens of the flash.

Submit your photos as a single jpg file, attached to an email, not embedded in the email. Send one photo per email, and include WITH EACH EMAIL YOUR NAME, MAILING ADDRESS AND PHONE NUMBER. If it isn't identified, it won't get looked at, so please label each.

If you send a CD with photos, write ON THE CD (NOT ON THE ENVELOPE OR BOX) YOUR NAME, ADDRESS AND PHONE NUMBER AND EMAIL. The same rules apply – no information, it won't get looked at. We just don't have the time or people to organize a lot of photos and try and keep them all straight if they are not identified. Make it easy for us and you stand a much better chance of getting your shot in the calendar.

Deadline for submissions for *Bee Culture's* 2020 calendar is October 1, 2019 in our office and on my computer. Once entered, photos can be used by *Bee Culture* magazine.

As usual, send your photos as jpgs to me at **Kim@BeeCulture.com**, with 2020 Calendar in the subject line. FOR EVERY PHOTO (1 PER EMAIL) include your name, email, phone and address. If you don't we can't use the photo. And good luck!

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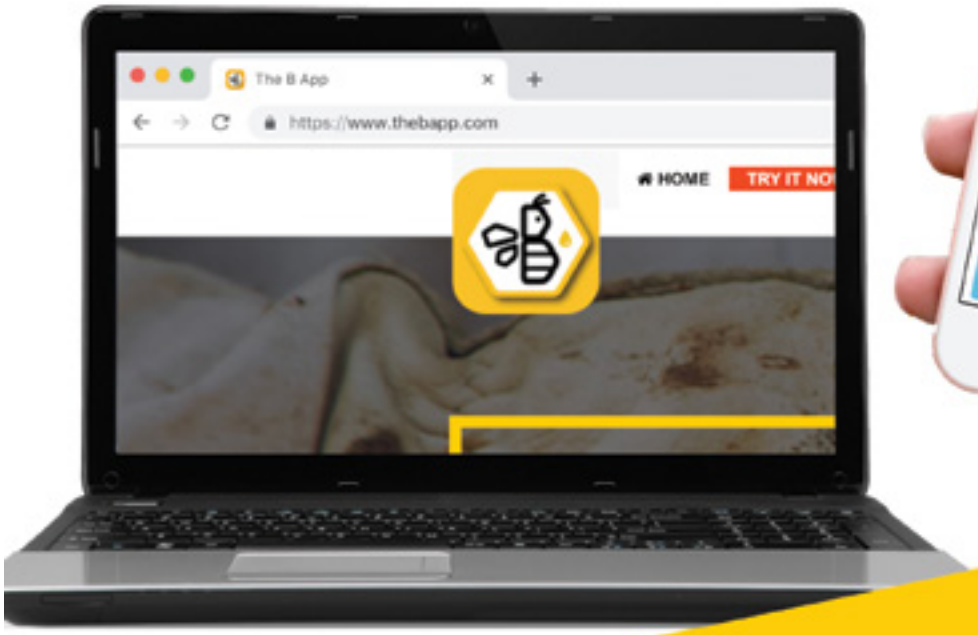

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This app is intended for commercial beekeepers with over 200 hives only. Backyard/Hobby beekeeper version is coming soon.

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This was the first of its kind in a whole new class of bee storages. Since then we have helped several other beekeepers build their own storages and have improved our design and ability to customize each project. We are also providing space for dozen of beekeepers in our bee storage facilities. With redundant power, ventilation and refrigeration systems, we leave nothing up to mother nature. Our experienced staff will make quick work of loading and loading trucks. You just send your bees to us and we'll handle the rest. Whether you want your own building or would like to lease space in ours, you can look to us to help you safely overwinter your bees indoors.

Tenney Lamoreaux, 208.644.0710, **Beestorages.com.**

All honey producers are familiar with **Honey Sticks** as a great way to increase sales and margin, but they are also aware of the downside – which is that these sweet natural treats do not usually contain the producers' own, Locally Produced honey. As beekeepers, Anthony's Beehive wanted to offer a solution to that dilemma – so we designed and built a tabletop machine to quickly and easily fill standard drinking straws with honey or other liquids, even gels.

This machine uses centrifugal force to fill 36 straws at one time. The process can be a bit sticky, but it is easy to learn and very effective. The honey does not need to be heated and there is enough force to fill straws with creamed honey or honey with additions such as small seeds or pieces of fruit. The machine is easy to clean and there is very little waste when changing from one flavor to another.

Details and video available at: **http://bit.ly/Honey_Straw_Filler** or at **www.AnthonysBeehive.com**.

Bees and Man. 70 Short Stories. William Michael Hood. 196 pgs. 6" x 10". Color throughout. ISBN 978-1-912271-45-0. Published by Northern Bee Books. $30

Mike Hood (he's only been Mike as long as I've known him), is Professor Emeritus Entomology from Clemson University in South Carolina. He retired in 2013. While at Clemson he was Extension Honey Bee Specialist and the State Apiarist. He's taught beekeeping, IPM including research on tracheal mites, *Varroa* and small hive beetle. He published a book on SHB a couple of years ago available from most bee supply companies.

His new book draws on his years of exposure to bees and people, and all the odd, weird, neat, necessary, and extraordinary things that happen when bees and people are in the same place at the same time.

He looks at what he calls Odd Bee Stories, including bees spotting parking lots, some of his research with bees, dealing with bees being out of place, bees and animals, bee city and chiggers in the beeyard. But he deals with more than honey bees – yellow jacket nests can be both exciting and scary, as can bald faced hornets. And of course swarms, where they do, and don't go and why.

His role as State Apiary Inspector probably led to what I thought were his most interesting stories – beekeepers he has met. Famous, and infamous, well known and not known outside their county, rich and not so rich, and more and more. This is, in my opinion, the best reading in the book. Many of these folks are gone, or have stepped away from public life and it is good they are remembered here. Steve Taber, Laurence Cutts, Burt's Bees, Fred Deer, Huck Babcock – the list goes on for this Who's Who chapter.

Basic beekeeping information and education has a place here too – equipment to use, and not use, where to put hives, a lot about stings, honey bee plants, and some about African honey bees in SC. And of course a lot about honey bee products – propolis, honey, wax, lotions and potions, pollen, apitherapy and other products you may, or may not choose to explore.

The book winds up with a chapter on Tall Tales. If you've ever been to a bee meeting that featured tall tales you know how outlandish some of them can get – and still be true. Pet catfish, peg legged pigs, and more. I only wish he had more of them.

The greatest value of this book of course is that it gives a human face and name to some of the more colorful individuals in our industry that too often become lost in the smoke of our everyday beekeeping. Thanks Mike.

Kim Flottum

Queen Spotting. By Hilary Kearney. Published by Storey Publishing. 127 Pgs. Hard cover. Plus many multiple page foldout sections. All color. 7" x 8" ISBN 9781635 860375. $19.95

We have two books by this author this time. *Queen Spotting*, and *The Little Book Of Bees*. My thought was that this very busy author, who runs Girl Next Door Honey, had the same idea I did when I saw the two together – Christmas is right around the corner, and these two books are ideal as gifts for both wannabees, beginners and even experienced beekeepers.

Queen Spotting is a book about just that – finding queens. Four chapters, each with several multiple page foldout pages full of bees (see the photo) – Inside a colony, with both easy and intermediate hard to find queens, Life of the queen bee, with intermediate and advanced hard to find queens, and How to spot the queen, with difficult to find queens. All of these queens are on full pages of bees on comb. Some are one page, some two and some even four. Find the queen. Great practice for next spring when she's moving. Good information on queen biology and bees in general. A great gift.

The Little Book Of Bees by the same author is published by Abrams Publishing. It is little, 5" x 7" but it has 223 pages with lots of photos and drawings and a hard cover with color all over. ISBN is 978-1-4197-3868-5 for $16.99. Chapters include the story of bees, superorganisms, honey, beekeeping and protecting our bee buddies. This is meant for beginners, wannabees and those simply curious about honey bees, and other bees, in general. And I have to admit, that she mentioned *BackYard Beekeeper*, and *Bee Culture* as references was a plus.

Kim Flottum

INNER COVER

"America's farmland is disappearing at a rate of three acres every minute." *American Farmland Trust.*

AFT surveys land use with more precision than anybody or any agency I am aware of. I've been following their land use studies since they started making them, in conjunction with the Federal Government, 20 some years ago. And that's 'farmland' they are measuring. The places we grow food, fiber, forest, pasture and more food.

Let me put that in perspective. This year we planted some 80 million acres of soybeans. Losing three acres of soybeans every minute, in 50 years all those acres will be gone – converted to concrete parking lots, freeways, lawns, factories, parks and flooded land from rising seas. Or share the pain and figure half the corn and half the soybeans will be gone. Better, at that rate in only 33 years ALL of the National Parks will be gone. One more, in only a single year losing three acres a minute, all the almonds in California would be gone. All of them.

Yet another. This year there's right about 23 million acres of CRP land. That's where beekeepers go to stay away from pesticides, to get enough safe food for their bees, because corn and soybeans and almonds aren't safe. At three acres a minute, in 14 years, all of the CRP land is gone. And, I'd bet, so are all the beekeepers who used to use that land for summer refuge from the harder side of life.

Speaking of which, only about 17% of the land in the continental U.S. is agricultural. With right about 1.9 billion total acres in the U.S. then, that means there's roughly 325 million or so acres of good cropland to start with. Let's see. Losing three acres a minute, it should take just over 200 years to eat that all up with – stuff that isn't farm land.

As an aside, there's right about four million acres of paved roads in the U.S., but 40 million acres of tidy lawns beautifully mowed, fertilized, chemically weeded, and enjoyed by all the corporate land owners at Headquarters USA, and of course neighbors and their homeowner associations, cities and urban parkland, golf courses and athletic fields everywhere.

But wait, there's more. Between 1992 and 2012, we converted 31 million acres of ag land, including woodlands and low-density residential development, into non-agricultural land. That's most of Iowa, or the entire state of New York. Of that, more than 70 percent of urban development and 62 percent of all development took place on ag land. Urban expansion was 59% of all of that including commercial, industrial, transportation and high-density residential development. And low-density development, that is exurban homes on large lots, took 41 percent of that.

Obviously all farmland isn't used for intense row crop production. It includes pasture, forest, and rangeland, which, in some cases renders it less developed than cotton or citrus acres. And by less developed I essentially mean safer-to-be-on land, rather than tread-upon-at-your-own-risk land.

And, as the best land is gobbled up, land that is more marginal gets used, so even the average to almost useless land is now farmland that once was, for all intents, safe forage land. It just gets worse and worse.

And let's take a look at that really good land, where it is and what's happening. Look at a U.S. continental map.

Cropland is, for the most part most of SD, the eastern half of ND, southern half of MN and WI, most all of IA, IL, IN, east OH, the north half of MO and some of NB and KS. Then follow the Mississippi river to the gulf, and add in a bit of east TX and south FL. Add in range land from NV to CO mostly north to south and throw in the big valley in CA and a tad in northern WA and that's about it. Lots of forest in the east third of the country, but lots of urban there also.

How much is used, however, is a bit different. The best is used for sure, but marginal land is more and more put to the plow to make up for the losses of the good land. Figure from MT, then ND all the way south to TX and all the way west to OH, and down the Mississippi river as basic agriculture, and some of the remaining western states as federal grazing land. And all of this, good and bad, is disappearing at three acres a minute.

And water. The changing climate has caused shifts in where things can be grown, even if there isn't competition for urban development or other uses. These changes include rising temperatures, increase in frost-free periods, increases or decreases in extreme weather events like droughts, floods, fires and heat. Add to this decreased winter-chill units making it impossible to grow some fruits now, along with hurricanes and increased precipitation leading to less fertile and increasingly eroded landscapes.

Oh, I almost forgot energy production. It's predicted that in the next 20 years, domestic production from all energy sources will rise by nearly 30 percent and impact about 200 million additional acres – that's bigger than Texas, just so you know. These include nuclear, natural gas, coal, renewables like wind, geothermal, solar and hydropower and biomass, and biofuels like corn, sugarcane, soy and cellulose.

Land Loss.

Then there's ownership. Something like 40 percent of all U.S. agricultural land is owned by people over the age of 65 (sound familiar?), and over the next 20 years something like 350 million acres could change hands, and beginning farmers have issues with debt, startup costs and affordable land. Average farmland in the ag belt ranges from something like $7000 - $12,000 an acre. But convert that land to urban development, and it goes for something like $30,000 an acre in some urban locations, down to as low as $20,00 in less developed areas. You can guess who to sell Dad's farm to.

As a result of all this there are fewer, and fewer and fewer places to let your bees roam that are productive, safe and easy to get to.

Those three acres of farmland that are disappearing every minute are turning into those roads, parking lots, lawns, factories, city parks, solar and wind energy generators, gas pipelines, biomass producing land, and land covered with water that wasn't covered with water just a couple of years ago. People and climate change are eating your bees' forage at three acres a minute, every minute of every day, all year long. Three acres. Every minute.

Why all this? Well, I just listened to a well-meaning, terribly ill-informed, environmental activist screaming at beekeepers about how they are killing their bees by – one, stealing all their honey every Fall; two, feeding them HFCS to make up for that; three, cramming them in boxes they are not meant to live in; four, poisoning their home environment with chemicals used to kill mites instead of letting the bees not resistant die and keeping only those that survived; five, putting them on trucks and subjecting them to truck fumes, disruption of their seasonal cycles, and denying them their normal and healthy food sources, and six; stacking them 10 deep by the acre in holding yards and making them share all of the problems bees have from everywhere they came from; all this so they can go someplace somewhere to pollinate some crop for money for the greedy beekeeper.

I know you've heard that person a lot of times saying basically the same thing about greedy beekeepers taking advantage of their bees simply for profit. We are an easy target for some groups who what to blame the ills of the world on someone else. Ignoring them is usually the best way to handle that, or at least I thought it was for a time anyway. But they lump in all manner of cruel and unusual crimes here, implying that our actions are actually killing the bees that put food on our tables.

So for what it's worth, here's what I think.

Because that person buys three quarters of his honey from some beekeeper in another country, and because that person chooses to live in that new suburban development just north of town that was a farm two years ago, that now has a lush, bee-free lawn pampered with water diverted from a nearby irrigation water source, and because that person wants a pristine, hosed down once a week to get the dirt and stuff off so that it can go into the local waste water disposal parking lot when he goes to a distant, low-priced corporate-owned store on a newly constructed road in his gasoline driven car, and carries home his groceries in a plastic bag that goes to a new land fill on the other side of town so the smell doesn't interfere with his backyard picnic near the pool filled with water that could have helped that farmer just out of town water his cattle or his crops, but now he can't so he sold out to that developer and made a fortune to retire on, and sometimes shops at a local farm market, but usually buys produce and meat and dairy and everything else that's fresh and in season from that grocery store he got his honey from and that comes from a farmer south of the border at way, way less than the local CSA can sell it for . . .

OK, take a breath, Kim.

So, you see where this is going. When people talk about bees dying you should talk about people being greedy, unthinking and uncaring. It's not beekeepers that are killing bees, it's the people beekeepers are trying to feed that are killing bees. It's a simple fact. They are their own worst enemies. It ain't that bees are dying. It's that our caring consumers are killing them, at three acres a minute.

•

And this brings me to our latest information news source. As you probably know, every day we send out a news piece from somewhere dealing with the business of bees in some form or other. It's our daily CATCH THE BUZZ. This little item reaches, either directly or passed on from newsletter and Journal Editors, or other social media folks, nearly 43,000 people a day. Yes, 43,000 a day. Now, if you are like me and a news junkie, you'll read at least five of those a week and usually all of them (there are usually six). If you're not, we've found, you'll pick up on three or four, but, and this is important, later, you'll go to our web page and scan those you missed. The BUZZ is a lot of work, but it reaches a lot of people with what we think is both useful and interesting information.

So, we are going to try something a little different. If you read the information above on land use changes and the reasons whey, you should have noticed that some of the three acres of land a minute we are losing is due to the effects of climate change – this is, our weather is causing droughts, floods, rising coast lines, warmer and shorter Winters, longer and hotter Summers – and all of these things, one way or another, are affecting our bees, where our bees can forage, and what's available when they get there. And knowing what to expect is half the battle. So, starting in early August, we introduced CLIMATE CHANGE CACHETS. Four or five short pieces once a week that are pretty much directly affecting what we as beekeepers do, can do, should do or shouldn't do because of all this.

So watch for CLIMATE CHANGE CACHETS once a week, usually on the weekend, edited by our regular correspondent Alan Harman.

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It's Summers Time –

Heading Into Fall

It's hard to believe I'm saying that already. This has been a very odd Summer – not only here in Northeast Ohio. Kim and I tend to be 'weather watchers.' We have so many people – friends and family – in different parts of the country and abroad and we're always checking to see what their weather is like. And of course, our fancy IPhones make that so easy.

Right now, in early August as I write this, we have already broken our average for Summer days over 90° and we still have all of September to go. We usually get on average 10 days over 90° for the whole Summer. It's been hot here.

But other places have been having really extreme heat. Those places like CA, AZ, FL have been even hotter than usual and I've been hearing about extreme temps in Alaska of all places. Something is going on. Call it whatever you want, but this has been a strange year.

Fall in NE Ohio is usually a beautiful time. The colors are amazing and you still have enough warm days to be outside and not be uncomfortable. And I enjoy the process of getting ready for Winter – dealing with plants and birds and bees.

We've actually had a couple of weeks without much rain. And we've had lots of sunshine. So even though we had to do our garden in pots, things are really starting to do well. Of course, it was the very end of July before we got our first tomato. But now we're getting tomatoes and various types of peppers just about everyday. So delicious.

I love handing over fresh tomatoes to those friends that don't grow their own. We have two friends that will take tomatoes over chocolate. I know, I don't understand that either.

Our Bee Bee (*Evodia)* tree bloomed just over a week ago and with all of the sunshine our bees have been able to take full advantage of it. It will bloom another week if the weather holds. A friend sent us a bunch of Bee Bee tree seeds, so we're hoping to get some more seedlings going and maybe end up with a small forest.

Hibiscus

Bee Bee Tree

These trees are amazing. When they are in full bloom on a sunny day you think there is a swarm in the tree. The hum of the bees is incredible. Happy girls!

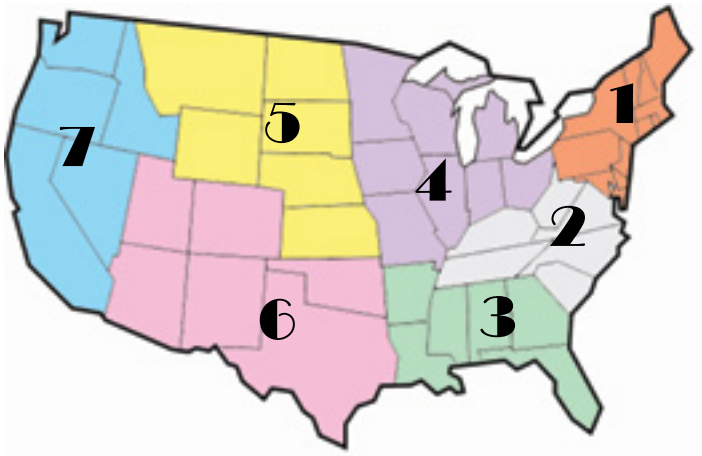
In spite of the heat and the huge amount of rain we had in June and July, lots of things are blooming around our property. We've created a pretty big patch of Milkweed and I've seen several Monarch butterflies just in the past few weeks. More than the last three or four years.

My hibiscus is now loaded with buds. They are so big and beautiful. I'm not sure the plant can hold up to the weight once all of the buds open. I think this is the third Summer for it and each year I have to keep Kim from chopping it down becaue it takes a very long time to come back. But once it does it is amazing. It's the same with the Rose of Sharon.

The ducks and chickens are doing well. We did lose one more of the older hens a few weeks ago. She seemed fine and then just tipped over. We still have the little crippled hen. She is getting around better each week and the others don't pick on her, so we'll see what happens. She's a good bit smaller than the others, but Kim always makes sure she has easy access to food and water and that she safely gets inside each evening.

I hope you have all had a good Summer and that your bees are doing well. It will be interesting to see what Winter brings to each of us.

SEPTEMBER – REGIONAL HONEY PRICE REPORT



Spring & Summer Colony Losses The Weather, Crops And Queens

How did things go this past Winter and Spring, so far. It was crazy it seems, but maybe not from a bee's point of view. Here's our numbers on Winter and Summer losses, Spring and Summer crops, the weather and queen replacement so far.

We started with Winter losses this year, and it seems our reporter were right in step with the rest of the world when they reported a 37% overall winter loss across all regions. The highest was in Region 5 with a 59% loss, numbers were all over the map. Region 1, 0 – 100, region 2, 0 – 70, region 3, 0 – 40, Region 40 – 90, Region 5, 25 – 100, region 6, 0 – 100 and region 7, 0 – 99.

Then, Summer losses up to July first really tailed off, with only an 8% loss for the April to July time period. That was encouraging. Though much lower, there were a few hot spots, but very, very few. Most were in the 5 – 10% loss, with a few up to 60 or so, but very few.

So how does this stack up with the honey crop this Spring? 37% of our reporters had an average to above average crop this year, while 40% don't really have a Spring crop, so that means about 40% had a reduced crop this Spring. Pounds/ colony were Region 1, 70; region 2, 38; region 3, 40; Region 4, 64; Region 5, essentially 0; Region 6, about 30; and Region 7, 55. See below for how the weather may have had an affect on this. Remarkable, actually 7% reported better than average weather this Spring. That should tell you something.

So how was the Summer crop? We don't get to late Summer crops yet, so what we found was that 41% had an average to above average crop this Summer. But 22% report they don't normally get a Summer crop, so that means about 37% reported a reduced Summer crop. Weather, again was probably partly to blame for this.

So how was the weather? 30% reported better than normal or average Summer weather, but take those 22% out who don't normally get a Summer crop and you end up a dismal 48% had crop reducing weather so far this season. With the rain and cold in so many places, that's not really a surprise.

Queens. Lots of noise this season, but let's see. 55% or all our reporters had to replace less than 10% of their queens this Summer, a healthy number, especially this year. Meanwhile, just under 5% had to replace more than 75% of their queens, which, again is a pretty healthy number.

	REPORTING REGIONS							SUMMARY			History	
	1	2	3	4	5	6	7	Range	Avg.	$/lb	Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS												
55 Gal. Drum, Light	2.24	2.19	2.19	2.23	2.17	1.98	3.00	1.60-3.00	2.18	2.18	2.17	2.32
55 Gal. Drum, Ambr	2.15	2.20	2.10	2.25	2.15	1.73	3.00	1.35-3.00	2.13	2.13	2.07	2.16
60# Light (retail)	216.10	187.50	188.33	184.50	167.67	165.37	216.10	131.74-325.00	203.82	3.40	204.69	203.68
60# Amber (retail)	215.28	189.45	180.00	180.75	215.28	155.87	235.00	122.74-325.00	206.70	3.44	207.03	202.50
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	108.52	76.10	64.00	69.67	74.42	108.52	108.52	57.60-194.40	91.05	7.59	89.49	82.72
1# 24/case	133.21	107.78	115.84	83.48	131.33	81.90	168.00	44.00-240.00	124.41	5.18	132.82	122.26
2# 12/case	140.95	97.20	105.19	98.24	111.84	140.95	140.95	79.20-246.00	119.31	4.97	115.39	109.40
12.oz. Plas. 24/cs	99.80	102.69	94.32	86.80	71.40	106.80	96.00	34.44-172.80	95.98	5.33	102.41	96.80
5# 6/case	146.64	111.23	112.50	112.38	113.16	146.64	146.64	71.50-240.00	137.52	4.58	129.43	128.66
Quarts 12/case	179.05	150.53	134.75	109.20	146.67	119.40	144.00	109.20-300.00	153.50	4.26	153.66	153.51
Pints 12/case	95.65	96.25	78.67	69.84	96.50	95.65	84.00	60.00-140.00	91.30	5.07	94.81	93.27
RETAIL SHELF PRICES												
1/2#	5.42	5.12	4.15	4.88	4.17	2.28	5.42	2.28-9.00	5.20	10.41	4.92	4.77
12 oz. Plastic	7.12	7.34	5.96	4.78	5.26	5.94	4.20	3.79-12.00	6.34	8.45	6.17	5.81
1# Glass/Plastic	9.42	8.34	7.87	6.16	7.28	6.16	7.88	4.79-17.00	7.95	7.95	7.86	7.18
2# Glass/Plastic	14.68	13.69	13.71	10.86	11.86	14.68	16.00	6.70-25.00	13.51	6.76	13.11	12.17
Pint	12.03	11.28	9.30	8.50	10.63	8.65	10.60	4.00-22.00	11.05	7.37	10.65	10.02
Quart	21.21	18.83	15.96	13.33	17.40	15.66	20.38	8.00-40.00	18.41	6.14	18.21	17.32
5# Glass/Plastic	32.19	32.15	36.58	24.20	23.90	17.89	50.00	15.00-55.00	29.37	5.87	28.18	26.56
1# Cream	10.57	8.67	7.00	9.70	11.08	10.57	10.00	5.99-16.00	10.14	10.14	9.82	9.03
1# Cut Comb	14.21	15.84	10.39	11.30	15.50	14.21	14.21	6.00-24.99	12.93	12.93	11.99	10.75
Ross Round	10.39	6.80	10.39	13.50	12.00	11.00	12.49	6.00-15.60	9.98	13.31	10.02	9.14
Wholesale Wax (Lt)	7.70	5.73	5.00	6.29	6.81	4.00	8.75	2.50-15.00	6.66	-	6.81	7.06
Wholesale Wax (Dk)	6.96	4.61	3.78	4.78	6.96	2.88	15.00	2.00-15.00	5.42	-	5.10	6.25
Pollination Fee/Col.	90.18	73.00	61.67	107.50	90.18	90.18	49.00	45.00-150.00	82.85	-	86.22	84.29

NEXT MONTH

Welcome to NEXT MONTH, where our Honey Reporters share a line or two about what they will be doing NEXT month, October, with their bees. Advice is given for each region so you can see what others are doing where you are, and, of course in all the rest of the regions. Check these out. These reporters are successful in business.

To do in October

Region One

- Pull supers
- Treat for mites
- Reduce size of hives into Palmer nukes
- Distribute filled honey frames among hives
- Feed
- Check honey stores
- Check for *Varroa* mites
- Queens- check, replace or combine
- Medicate
- Mouse guards
- Prepare for Winter
- Provide top ventilation and insulation
- Start wrapping with tar paper
- Inspect brood
- Insure adequate stores
- Balance weak hives with brood from strong hives

Region Two

- Clean up
- Winterize
- Assessments and treat for mites
- Combine failing, healthy hives or whose with weak but healthy status
- Feed to prepare for Winter, and check stores and feed as necessary
- Apply insulation
- Inspection to ensure queen right and combine hives if not
- Paint equipment- especially for Winter colonies
- Monitor mites levels and treat if threshold is met
- Feed 2:1 sugar water to colonies as needed for winter food stores required, but know how much sugar is eaten so you feed enough
- Check for disease
- Determine if hives are filling up for the coming Winter

Region Three

- Install strips for mite control
- Check to see if they have enough feed for Winter
- Leave plenty of stores for Winter
- Check mite levels
- Feed
- Be sure I have mixed enough syrup to feed light colonies
- Winter prep – weigh the colonies
- Put up wind breaks around colonies
- Splits

Region Four

- Install mouse guards
- Feed if necessary
- Treat for mites
- Leave enough honey for wintering
- Check honey stores
- Check hives for Queen, eggs, larva capped brood
- If necessary combine weak but healthy hives
- Pull honey and treat
- Feed syrup and pollen patties

Region Five

- Keep adding honey supers
- Check and control mites
- Check food supply
- Finish medication
- Start closing entrance for mice
- Send to cold storage
- Check on Queen health
- Feed back their honey

Region Six

- Treat for mites
- Check for honey stores
- Feed sugar syrup
- Before cold sets in, put fondant on top
- Use mite treatment after removing honey
- Treat for *Varroa*
- Check for any foulbrood
- Place fresh honey supers on strong hives

Region Seven

- Treat for mites
- Top off with Winter feed
- Check on mites – try to control them with medication
- Feed in hive
- Organize food/brood
- Move to Winter location that receives good sun.

Honey Reporters Wanted

We are expanding our Honey Reporter population and need new reporters in EVERY region. We ask that you fill in most of the wholesale or retail or both sections, most months, and our short survey on the back. We give you a FREE subscription for your service. So if you are interested send an email to **Amanda@BeeCulture.com** and put REPORTER in the subject line. Include name, email, phone number and mailing address and we'll get you the next Honey Report form. Sign up today and be a part of the BEST Monthly Honey Price and Beekeeping Management Report in the industry.

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"Whoso stoppeth his ears at the cry of the poor, he also shall cry himself, but shall not be heard."
– Proverbs 21:13

THE STORY OF A.I. ROOT

The Warehouse Fire!

A.I. **Root**

At the national convention in Cincinnati in 1882 I had announced that I would take a foundation mill with me and that I would make comb foundation before all who cared to see. Mr. Muth gave me a barrel of nice beeswax and one of his honey extractor cans and we had a steam pipe attached to the apparatus for melting. As soon as the wax began to melt, curious people gathered around, for the convention was held at an exposition.

"Is that maple sugar?" asked one onlooker, and at the word, everybody else began to walk over toward me. Did you ever see bees start over to a place in a hive where a new queen had just been run in? Well, I seemed to be the new queen, but I did not want to be just then, for I was not ready, and the man who was to bring in the foundation mill had not come yet.

By this time a crowd had collected. As usual, when anyone brings something to an exposition, people expect to see something nice or funny, or else, why should it be brought? Someone in the crowd picked up the wax and wanted just a little piece to wax thread with, but you see it was not mine to give away. They got in my way, and wondered if that was water in my tub until I began to feel almost cross, but I just looked pleasant and talked while I stood behind my stand and dipped wax, and wished and wished that the man would come with the mill, as he had promised to do. It was half past two, the appointed time we had agreed to make foundation and everyone was looking at the plain sheets of wax in a disappointed way.

"The machine will soon be here to make the cells in the sheets," I kept saying, but while I said it, I kept fearing that something would go wrong, and that it would not come. Finally, however, it arrived, and was set down on the stand. Before I could turn some one had run a card through it just to see what it would do. I was horrified for it once cost me a ten-dollar bill when a child ran a piece of tin through one of the mills. While I was explaining to the thoughtless friends that it was a very dangerous thing to do with such a machine, some one else who was not listening, ran another card through. By a stroke of wit, I unscrewed the crank and took it off.

All Because I Could Not Make Starch

Then in a nervous, fidgety way I began preparations for making starch to lubricate the mill. I put some water into a pail, stirred in some starch, put it under the steam, and nervously waited for it to get thick. I made it so hot that it burned my fingers, but it was just harmless milky water and nothing more. The people were so eager, I feared every moment they would be rolling sheets of wax through without any crank or starch. I asked if any one in the crowd could tell me how to make starch. Not a man there knew how. I began to doubt whether there was a man in the state of Ohio who knew. I had just got up courage enough to ask a lady who stood near how to make starch, but she walked away. I put on my most winning smile and turned to another one.

"My friend, will you be so kind as to tell me how you ladies make starch?"

Not a word.

"Just a common starch, such as you ladies starch clothes with?"

She looked as if she had no ill will towards me at all, but offered not a word in return. I began wondering if this were not really a fairyland in good earnest. I looked around for a friendly face. Not one did I see.

"Why, that woman is deaf, she can't hear a word," said a bystander, and that unraveled the mystery. At this moment a friendly face did come into view. It was Prof. Cook and wasn't I glad to see him! He asked me if I had boiled the starch and I said yes, but I was not real sure. He just put the steam pipe down into the starch and made it boil and then it was thick and starchy, to be sure. I made up my mind I should never scold anyone after that for being thick-headed.

By the aid of the starch the $25.00 mill rolled beautiful foundation the very first time and a friend who saw how hindered I was by the crowd invited me to come inside his enclosure where an iron fence kept the crowd away. Another friend sat down with a penknife and cut the foundation into little pieces and distributed them among the crowd.

I came pretty near falling in love with Cincinnati. I loved her children and I loved her men and women, and I felt that I could love even those who sold so much beer and tobacco.

Before I got through someone rolled a piece of dry wax through the Mill so it could not be used any more until I got home.

The Warehouse Fire

It was Sunday evening, March 7, 1886. I sat at my desk reading the Sunday School Times, and I noticed that the lesson for the following week was from the book of Esther, so I took

my wife's Bible and read the book of Esther clear through. By that time I was getting so sleepy that I thought I would go to bed. The print in her Bible was rather fine, but for all that I had not used spectacles up to that time, even though I was then 46 years old. Maybe the fine print made me drowsy before my usual bedtime. It seemed but a short time until my wife startled me from a sound sleep by asking what that light was out of the window.

"Why Amos, there is a great fire, and as true as you live, it is our warehouse."

I remember she said something about the poor horses and our Jersey cow, and as I sprang from the bed wide awake in an instant, I meditated running to the scene of the disaster without dressing at all, but in a small part of a second I decided it would be better to clothe myself so I could stand the weather even if some time were lost. Many times I had planned what I should do if the factory should be discovered on fire, but I had never thought of a fire starting in the warehouse, for no fire was ever kept there – not even a lantern had been there for weeks. The building was all alone except for the piles of dry pine and basswood lumber between it and the factory.

About this time I began to hear the hoarse cry of fire from neighbor to neighbor. The first thing to be done was to give notice to the fire company. Too much depended on every moment of time to trust to anyone and I started on a run for the engine house, but just as I passed the factory my brother-in-law shot past me on one of his horses yelling worse than a Comanche Indian. I did not know before that any horse could go so fast nor that human lungs could utter such unearthly shrieks.

The boys who slept in the factory were now awake and yelling after the example set them by my brother-in-law. I told one of them to stay about the factory and then we went down to see what could be done for the warehouse. By the time it got there, it was pretty near all burned. Not only the million sections stored there, but all my tools and agricultural implements and ever so many other things that represented the hard work of years, were destroyed. Worse than all, a south wind drove the fire fiercely into the lumber piles and it seemed for a time that nothing could prevent it from sweeping clear to the factory and licking that up, too. How I prayed to hear the roar of the fire engine. Finally it commenced coming and hundreds of willing hands lifted the great hose toward the lumber piles. Almost immediately the water stopped, however, for in their zeal they had pulled the hose in two before it was fairly coupled together. A messenger had to be sent back to the engine to stop the flow of water, while the hose was mended. Finally it began pouring a great muddy stream on the burning piles, but to my great dismay the fire seemed to burn just as well with water on it, as it did without. Water was poured through the openings between the boards, but as soon as it stopped even for an instant, out came the flames again.

The fire was within a few feet of the second warehouse containing seasoned lumber and hives, and it seemed as though even a fire engine was powerless to stop it. By this time men and women had formed lines, standing in the mud meanwhile and pails were passed from one to the other, while this second warehouse was kept drenched on the roof and along the sides and ends by means of little pumps. For hours the people fought, making apparently but little headway. But the wind finally veered around a little and a snow storm set in, and by God's providence we conquered.

In the weeks just past my health had been threatening many times to break down and so as soon as the fire was under control, I began to feel that if I were to be of any use that next day I must get some sleep. Many friends assured me that this was a wise thing to do and therefore, I obeyed and went to bed. Now it has always been said of me that one reason why I can stand so much mental strain, is that I can go to sleep at any time of day or night. Was I equal to the task now? I began to feel that I was not, until I questioned myself in regard to God's promises. Whose property was it that was burning? I held the title to it and it was all paid for, but was it mine or the Master's? I had often told him on bended knees to take me and all that I was and all that I had, in his care and keep it.

Here was a chance to practice what I had preached. If it was through any fault of mine that the building was burning I might lie awake, and worry, or get up and right the fault. If, however, it was something I had nothing to do with, why should I be troubled? If the property was all in God's hands and he had seen fit to let it be taken away in this manner, why should I worry or lie awake when rest was so much needed? This reasoning took perhaps five minutes and then I went to sleep as if nothing had happened. When the fire engine stopped for a few minutes, however, I sprang up instantly. My wife asked what the matter was. I told her that they had stopped throwing water. Can you imagine how sweet the sound came as the booming commenced once more. I afterwards learned that they had stopped long enough to disconnect the hose and put it under the railroad tracks, so it would not be cut by an approaching train. One other stop was made and I awoke as promptly and commenced dressing, until they got started again. Even while sleeping soundly I kept in mind that if our town waterworks should give out, the fire would again be upon us.

When daylight came the flames still burned high, but they were held captive. Sure enough the firemen had exhausted the water from the reservoir and they were obliged to wait until afternoon, so that more could be pumped, and then and not until then, was the fire put clear out.

My loss amounted to some ten or twelve thousand dollars, and I had insurance for a little less than five thousand. I had a great abundance of seasoned basswood and pine that the fire did not touch, and better machinery than I ever had before, so I knew we should not be behind very much on filling orders. The day after the fire I read from the book of Nehemiah how they built up the walls when the gates had been burned down by the enemy.

By March 16 we had quite a pile of selections ahead awaiting orders, and by working from daylight until dark we managed to supply the wants of our customers as if nothing of the kind had occurred.

Now, then, how did the building get on fire? Nobody knows. My wife inquired about our old trusty family horse who for toward twenty years had been a faithful servant. He used to bring my wife to church from her home down by the river, and later he had taken each new baby out for its first ride allowing it to hold the lines. We showed her a blackened horseshoe. It was all we could bring as a remembrance of the faithful old friend that had been her special property for so many years.

The first neighbor who came on the ground when the building was burning saw the doors of the warehouse open and the two horses loose in the field. Poor old Jack, in his fright, ran back into the fire and turned into his old accustomed stall. Both horses had very strong leather halters on their heads, and the rings in the halters were found in the ashes by the mangers, indicating without question that somebody had unbuckled the halters and slipped them off, turning the horses loose, after they had removed the bars and opened the doors. The warehouse had been fired in different places. "An enemy hath done this," was the language of everyone, but what enemy had I who could thus desire to destroy my property, taking the lives of domestic animals and endangering the whole of this part of town? BC

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BEE TALK

Send us your questions, we'll find the answers. Our regulars and our guests will share what they know. Send your questions to Kim@BeeCulture.com, *with BEETALK in the subject line.*

Question 1

Would you please articulate the value of bees as emotional support animals? My co-op apartment building prohibits "pets or animals of any kind . . .", but they must accept emotional support animals, so I need to convince my doctor to write the prescription. We all know the wonderful calming effect that comes over us when we enter our bee yards. Moving my hives to my balcony would disturb no one and bring me great peace of mind. Thank you. Frank Linton

Maybe look at this from a different direction. We see communities empowering volunteers to engage their green thumbs in initiating and caring for beautification/pollinator plantings. I have witnessed on both coasts programs of senior community adoption of an observation hive sited in a public area with colony care provided by a group of volunteers. Would your community consider such a proposal – you could be the lead to teach others how relaxing the sights, sounds and smells of bees can help calm us? *Dewey Caron, Professor Emeritus U of DE and Affiliate Horticulture Professor OR State Univ*

I would recommend presenting your doctor with a book, *The Joys of Beekeeping*, by Richard Taylor. It is not a long book to read and although it does give beekeeping information it is not about how to keep bees. Rather it describes the many ways keeping bees enriches the beekeeper's life and yes, brings joy to life. *Ann Harman, VA*

Although not generally considered a conventional animal, a hive of honey bees has been considered one of humanity's most gentle, soothing, and beneficial support systems for centuries. The custom of "telling the bees" of family events, such as marriages, funerals, and other important matters cements the important role that a hive has in the nexus of a beekeeper's psyche and family. While some people may regard the "telling of bees" as mere folklore, in my opinion, we should associate this practice with other cultural rituals such as daily prayer, exercise, and other health varia that serve to maintain mental and emotional equilibrium. *Tammy Horn-Potter, State Apiary Inspector, KY*

This is certainly an interesting question, and one I would have never entertained on my own. I could easily take the opposite approach, I have seen may seemingly intelligent, unflappable individuals loose it after a few years, further I have known professional highly intelligent/accomplished individuals state with great determination/exasperation that "I am going to make this work if it's the last thing I do," not a ringing endorsement for a companion animal. True the hobby of beekeeping can be very rewarding and relaxing emotionally to a degree, however the very opposite can also be said, the number of colony losses every year and the turnover of beekeepers compels me to suggest that beekeeping would never work as a stable/constant emotional support system. Lastly according to the Fair Housing Act FHACT, 42 U.S.C.A. 3601 two goals must be met for a companion animal application, 1) Does the individual have a disability? 2) Does the animal,(bee) provide emotional support for one or more (identified) symptoms. You have the cart before the horse! *Denzil St Clair, Queen Right Colonies, Spencer OH*

Bees and humans have a history together that rivals that of other companion animals. Provided that bees can be carefully managed to accommodate neighbors, the benefits they bring to those who care for them are immense. They provide comfort, a sense of pride, and even companionship as a living 'superorganism' that has many of the traits of other companion animals. Plus they will not eat songbirds or soil people's lawns. *Jay Evans, USDA Beltsville Bee Lab*

Honey bees are widely reported to instill a calming, peaceful and grounding effect on people, provided the person is not hyperallergic to bee venom or highly fearful of bees. However this appears to simply be an extension of the fact most things in nature, not just bees, reduce stress when a person is exposed to them in the natural world, whether it is animals that tend to live closer to the earth than we do (provided that one's life and well-being are not threatened in the process), or even just the sounds of the natural world. We humans are of this earth: we come from the earth, we live on the earth and in the end we return to the earth. There are few things in this world that can be as fulfilling, meaningful and healing as direct contact and experience with the natural world around us that makes up the earth, whether it is a walk in the woods, sitting by a waterfall, the view from a mountain peak, digging in the garden, or time in the beeyard. *Ross Conrad, Dancing Bee Apiary, VT*

While keeping bees can be beneficial for numerous reasons, every beekeeper has to ask themselves if the location they want to keep them is safe for their neighbors and the surroundings. Living in a congested area does pose a few challenges, which is most likely why your landlord is timid to agree. For one, it could be considered a liability to

have hives in an apartment building if there are folks who are allergic, or if poses a fire hazard, etc. A few organizations come to mind that might be able to help you navigate this discussion with the property owner.

The first is **HivesforHumanity.com**, which is based in Vancouver, British Columbia. They promote rooftop hives and engage in mentorship opportunities for at risk populations specifically to connect them to nature and to support their emotional recovery and wellbeing. Though you have a home, the concept of regarding beekeeping as a therapeutic activity is becoming more widely accepted and promoted.

Another organization that encourages beekeeping for therapeutic recovery is The Not Forgotten Outreach center which dedicated to motivating Military, Veterans & their Families, and Gold Star Families of fallen heroes to participate in recreational, therapeutic and/or farming activities to inspire the healing process. Not Forgotten Outreach creates opportunities to improve relationships and build comradery, while at the same time bolstering mindfulness and greater well being.

You may also want to ask your primary care physician if he can refer you to a counselor or behaviorial health practitioner who could work with you to draft a letter of support for your request to keep bees on the balcony as part of your therapy. *Melanie Kirby, AZ and WA*

As a beekeeper I share your emotional attachment and appreciation for honey bees. I do not see myself without bees in my life. Convincing non-beekeepers of this unique relationship is probably the easy part – guaranteeing they will not be stung or that swarms are safe is the challenge. Apartment and balcony sound like you have neighbors that will be very close to your bees, and you will be asking them to risk the occasional sting, and possibly a swarm. I wonder if there might be a more isolated spot on the apartment property that would limit non-beekeeper interaction with your bees. I hope you can find a way to keep your bees closer. *Dan Conlon, Russian Bee Breeders, MA*

Question 2

What do you, the experts in the field, think of screened bottom boards for Langstroth hives ? Do you use them on your own hives?

I do a Pacific Northwest survey of backyarders that keys losses to management. Fully 80% of beekeepers, n over 400 survey respondents, annually use SBB. However they offer very minimal improvement in survival, a statistically significant 3% average improvement over the past five years. SBB offer other advantages but are not great for mite control. The survey asks if screens are left open over Winter or partially/fully closed – those who restrict their opening over Winter have 10% survival advantage in our wet, cool PNW winters. (**www.pnwhoneybeesurvey.com.** *Dewey Caron, OR*

I have used screen bottom boards on Langstroth hives since they first appeared on the market. They remain on the hives the year around in my mid-eastern temperate climate. Hive debris falls to the ground a foot below. My climate can have wet conditions throughout the year. I find that the ventilation from the screen bottoms helps the bees control their hive interior conditions. *Ann Harman, VA*

Yes, we always use screened bottom boards. *Tammy Horn-Potter, KY*

We have used them for a fraction of colonies during the brood season on the assumption they can only help, but revert to standard bottom boards in the Fall. *Jay Evans, MD*

I use them in about 50% of my colonies and do like them for added ventilation purposes only, there is however a bit of risk involved with damaged screens if colonies are moved constantly. *Denzil St. Clair, OH*

I LOVE SCREENED BOTTOM BOARDS. They are one of my favorite things and we use them on all of our hives. In the wintertime, we slide in the IPM boards to close it off, but the ventilation provided from the screen is fantastic for air flow and minimizing colony loss during transport and the heated Summers with high humidity. I don't really know if they help with *Varroa* that much, but it definitely can't hurt and it increases our summer survival. That being said, if you forget your IPM boards, you'll take a hit on your Winter survival. It has to be part of your winterizing routine. *Jessica Louque, SC*

I use a few but only because I have them. I've even overwintered bees in Colorado on them. I haven't come to any conclusions on my own, because bees' resistance to Varroa varies so widely from hive to hive. I'm not aware of any research that supports their purported benefits. *Ed Cobey, CO*

As honey bee managers in 2019 one must use what is called Integrated Pest Management (IPM) techniques to control the #1 health challenge of managed honey bees ie. *Varroa destructor* mites and the parallel *Varroa* Virus Legacy. In the process of *Varroa* reproducing in a colony, emerging, and moving around a colony sometimes they are groomed off by the adult honey bee they are on or noticed by other bees and groomed off perhaps falling to the bottom of the hive. If the hive contains a solid bottom board and the *Varroa* is uninjured in the grooming process it will seek out a path back up into the brood area by walking independently or if it can jumping on a bee and riding back up. If this same *Varroa* mite had fallen to the bottom of the colony with a screen bottom board it will fall through the screen and onto the ground resulting in it being virtually impossible to get back inside the colony before being eaten by something on the ground waiting for a meal. *Jerry Hayes, MO*

I think the screen bottom board is a good tool for monitoring natural mite fall. It is not a method to control mites. I believe that mites falling onto the board are already old and dying of old age, or have been killed by grooming and hygienic bees. I don't use them on my own hives, but i use a *Varroa* shaker as my monitoring tool to determine mite infestation level. *Medhat Nasr, Canada*

I have come to believe that all hives should include a screened bottom board as standard equipment. They help reduce mite loads by removing mites that fall to the bottom of the hive and provide additional ventilation all with very low

cost of time and money. Here in Vermont I use them on all my hives and keep them open to the ground year around so that there is no need for me to regularly clean up the hive debris that collects below the screen over time and can attract wax moths, small hive beetles, ants, etc. *Ross Conrad, VT*

I used to use them on hives I kept in northern Michigan because the Summer humidity and moisture from Winter snowpack was easily trapped in the hives, which could cause a variety of issues (such as mold and mildew, respiration condensation raining back on bees during the Winter and drowning them). However, keeping bees in New Mexico, the aridity tended to dry out brood in the bottom box so I would leave them open for part of the year, but would seal them up when needed (dearth, windy seasons, and when predation was an issue (such as with yellow jackets). *Melanie Kirbey, AZ, WA*

I have a hundred screen bottoms on 10% of my colonies. I consider them helpful in reducing mites, but not enough to use exclusively for mite control. My management has been to use several strategies during the season to prevent & reduce mite levels: Mite tolerant bees, interruption of brood (mid-summer splits), monthly mite samples, and when needed oxalic or formic acid. Screens have been useful to monitor mite drop, and when left open some reduction of mites falling out of the hive. Screen bottoms can be effective during the hot temperatures we have been having this summer. I can walk through bee yards and know where the screens and solid bottoms are by the bearding or lack of - this season the added ventilation has also helped reduce swarming. *Bee Culture* had an article from the archives (50 years before mites) describing how to make screen bottom boards to reduce swarming. So I see value in using screen bottoms as an additional tool, but not as a standard piece of equipment on all my colonies. *Dan Conlon, MA*

Question 3

It's September in the central mid-west where I live. 12 colonies, all in my three acre backyard, kind of spread out. All are well-populated, busy with an active laying queen. The colony that did the best produced 124 pounds of honey in one harvest last week, the poorest did about 45 pounds the week before. All have been harvested, all are in two deeps and a medium, and all have lots of bees. Mite tests this week are devastating – the smallest colony with the fewest bees had over 30 in the alcohol test, and the largest had over 120. I tested every colony, and all had numbers similar. So… what do I do now – getting ready for Winter, honey harvested, colonies strong, at least by my standards.

The recommendation of the Honey Bee Health Coalition (HBHC) Tools for *Varroa* Management suggests no more than a 2-3% adult infestation level. Your levels are obviously much greater so control efforts should be considered prior to the rearing of the fat Fall bees to give colonies a chance to survive until next year. The Tools provides information on controls. **http://honeybeehealthcoalition.org/varroa** *Dewey Caron, OR*

Those extremely high numbers indicate that you may not have done any *Varroa* control methods during your bee year. Since it is now approaching cold weather in September in Iowa, it may not be possible to salvage these colonies. *Varroa* populations are peaking during July but without some form of control at that time, varroa literally took over. *Ann Harman, VA*

Treat for *Varroa* mites ASAP. (Is this a trick question? Am I missing something?) plus, see Addendum to #3: **https://honeybeehealthcoalition.org/varroatool/** *Tammy Horn-Potter, KY*

Treat immediately with your choice of miticide (I'd likely use Apivar) and then check *Varroa* levels again, and then treat with Apiguard if necessary. Depending on your Fall flow, throw some partial pollen patties in the colonies and syrup with Honey B Healthy (or not if your bees don't like it, as some won't eat it). I'd have screened bottom boards on until it gets through the first heavy frost then switch to IPM boards, although you might want to close them up early during a miticide treatment to maximize efficiency. You might lose a brood cycle, but at this point it's probably more beneficial to break the mite cycle than detrimental to lose a round of bees. *Jessica Louque, SC*

Call for a priest and an exorcism. No, seriously, I've been where you are. You will lose most, if not all of your colonies, whatever you do, but I'd hit them with the most effective miticide, which is probably amitraz. Then hope for the best. We can always hope, right? *Ed Cobey, CO*

Twelve colonies and the time frame make it relatively easy to treat for mites with oxalic acid vaporization every seven days for the rest of the month or until you have tests that indicate mites are no longer a threat. But if I understand your question the unstated concern is, and should be, the many viruses and pathogens caused by any mite load and especially one this large, unfortunately the damage if any has been done. You should still have time for one brood cycle before winter starts having an impact on the colony's population. In the future I suggest you opt for prophylactic measures and treat much more frequently than what is suggested, a minimum of four time per year for much better results. *Denzil St Clair, OH*

Thirty per 100 bees? Treat them hard, if it was just one with numbers like that I would say maybe kill them off before they take everyone down, but given it is the whole apiary maybe an intense brood-suitable treatment will leave you with something that could survive..but with only a couple months left max for winter bee production odds are slim. *Jay Evans, MD*

Really?! Nobody would be hopeless and helpless ANYWHERE if they have looked at the "Tools for *Varroa* Management Guide", **https://honeybeehealthcoalition.org/wp-content/uploads/2018/06/HBHC-Guide_Varroa_Interactive_7thEdition_June2018.pdf** as produced by the Honey Bee Health Coaltion. It tells you everything you need to know and lists all currently registed *Varroa* control prodcut options. Get it, read now, and treat with your *Varroa* selected product and procedure immediately if not sooner or you will be complaining

that your bees died over the Iowa winter and you don't know why. No excuses. *Jerry Hayes, MO*

I would immediately use Formic Pro one strip as on the label to kill mites right away on the bees. I would follow up by using Apivar strips (one strip for every five frames) covered with bees to kill any emerging mites in the next several weeks as well as [protecting bee colonies from re infestation by robbing bees. Over all I would make sure that my mite level is less than 1%. Meanwhile bees have enough population and good feed to go to Winter. *Medhat Nasr, Canada*

Most of us have been in this predicament and it is always frustrating when your biggest and most productive hives crash from mites late in the season. More brood = more mites. Hindsight would indicate stepping up the frequency of mite sampling and treat before mite levels become extreme. Mite prevention is always better than late season control. I consider August as the latest time to apply treatments and still allow several rounds of healthy brood to emerge before Winter. Knocking down mite levels is the first task. Bees will be left with viruses and that reduces their Winter survival. Having healthy Winter bees reduces the infection and improves winter survival. Some bees are clearly better at bouncing back from mites and viruses than others. If you have additional sources of healthy brood, move frames into pre-treated hives to boost healthy nurse bees, further reducing the spread of disease. I would also recommend checking Nosema levels as the combined damage of high *Varroa* and Nosema infection can double Winter loss. The most difficult part of your question is that you are addressing this in September. Any change in a honey bee colony takes at least a month, and your Iowan Winters can be early bringing long stretches of cold. We have similar conditions in New England, but sometimes it stays warm into November. We always attempt to save a colony, but most of our success comes from early inspections in August, and intervention that allows time for recovery. *Daniel Conlon, MA* BC

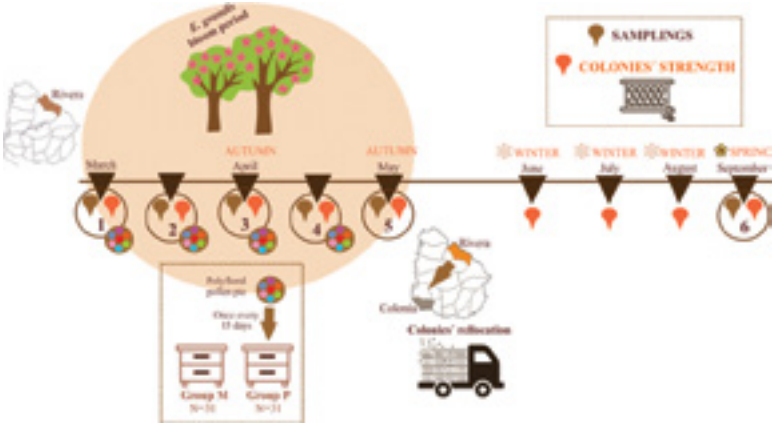
FOUND IN TRANSLATION

Genes, Germs And Stress

Jay **Evans**, USDA Beltsville Bee Lab

Honey bees are a resilient beast at the colony level, able to survive wholesale losses of worker bees to predators, weather, disorientation and often simply employee burnout after a few weeks of foraging. When most parts of the system are in order, small colony events that take away workers, brood, or food stores are reliably absorbed and the colony persists. These insults are not without some cost, though, and several recent studies tease apart how stress and disease acting on individual bees can lead to disfunction at the colony level.

First, consider disease. Infected bees can suffer physical damage ranging from weakened stomach walls in the case of *Nosema* infection to non-functional wings in the case of certain virus infections. Infected bees also pay an energetic cost when fighting off disease with an immune response, and might even suffer collateral damage on their own bodies through this response. Célia Bordier and colleagues in France have tackled the longterm effects on worker bees following an immune response ("Stress decreases pollen foraging performance in honey bees", Journal of Experimental Biology 221(4), **DOI: 10.1242/jeb.171470**). By using a non-pathogenic challenge, i.e., simply damaging the hard outer skin of bees, they were able to isolate the 'stress' cost of fighting disease from the actual cost of an infecting parasite. The results show a longterm change in behavior that is relevant to colony health. Most importantly, immune-challenged bees were half as likely to return from foraging trips with pollen. It is unclear whether they returned with nectar in place of pollen, or failed completely and came home with an empty honey stomach. When immune-challenged bees DID return with pollen, it took them 30% longer, suggesting they had issues with flight or navigation. The authors argue that changes in foraging success on this level, and shifts in what was brought back, can have longterm effects on the optimization of colony stores. While bees are known to compensate for gaps in hive resources (e.g., the ratios of stored pollen versus nectar), adding a bias against pollen foraging into the mix might compromise their investment decisions.



Another major stress for all pollinators comes from the quality of available forage. Adam Dolezal and colleagues explored the costs of poor flower resources on the abilities of bees to fend off viruses, a hot topic for bees in nature as well as managed bees ("Interacting stressors matter: diet quality and virus infection in honeybee health" Royal Society Open Science. 6: 181803, **http://dx.doi.org/10.1098/rsos.181803**). In their trials using bees caged in incubators, bees fed one type of pollen, from the Mediterranean plant *Cistus*, survived viral infection better than bees fed no pollen, but substantially worse than bees fed chestnut pollen or a blend of several more pollens. As in prior work, pollen supplements reduced virus levels overall when compared to bees fed simply carbohydrates. At the colony level, those with induced virus infections lost bees at a higher rate and losses were twice as severe in virus-infected colonies given no pollen versus those given any of the pollen supplements. Just this month, Belén Branchiccela, along with my USDA colleague Miguel Corona and others, showed similar impacts of pollen type on bee health in a field experiment involving commercial apiculture in Uruguay. This open-access paper, "Impact of nutritional stress on the honey bee colony health" (Scientific Reports, 9(1):10156. **doi: 10.1038/s41598-019-46453-9**), describes a season of migratory beekeeping, during which half of the colonies were boosted with pollen patties containing polyfloral pollen (graphic below). Despite ample natural forage, supplemented colonies showed increased brood production and colony sizes along with lower *Nosema* loads. As a neat observation, colonies NOT given the polyfloral protein boost increased their own collection of diverse pollens, perhaps indicating a colony awareness of the need for these pollens.

So, what is new on the impacts of chemical stress on colony behavior? Théotime Colin and

colleagues measured the effects of imidacloprid exposure on colony behaviors and traits in the article "Traces of a neonicotinoid induce precocious foraging and reduce foraging performance in honey bees", *Environmental Science & Technology*, *53* (14), 8252-8261 **DOI: 10.1021/acs.est.9b02452**. Larvae exposed to a standard low-dose exposure to this chemical (five parts per billion), commenced foraging sooner than normal and finished their lives with substantially fewer foraging trips, a shift that these authors have argued can greatly reduce the long-term prospects of bee colonies. Interestingly, in a follow-up paper just this month, "Long-term dynamics of honey bee colonies following exposure to chemical stress" (Science of the Total Environment, Vol. 677, Pages 660-670; **https://doi.org/10.1016/j.scitotenv.2019.04.402**), the authors found inconsistent impacts of thymol and imidacloprid stress on colonies, in fact showing an increase in colony size for bees exposed to imidacloprid in one site. These results could reflect the ability of honey bee colonies, some of the time, to respond to insults and come back with an adaptive group behavior. All these studies, by expanding lab results into colony level dynamics, were challenging and the results were often not predicted. Still, given the beautiful beast that is a honey bee colony of thousands of individuals, it is essential to see how the beast as a whole responds to injuries suffered by its members. BC

A Closer LOOK

IMPACT OF FUNGICIDES ON HONEY BEES

Clarence **Collison**

Almond growers face constant challenges to crop productivity owing to pests and pathogens, which are often controlled with a multitude of agrochemicals.

"There is growing evidence that insecticides and acaricides (miticides) are not the only pesticides that can have detrimental effects on honey bees (Mussen 2015)." "For many years the application of fungicides around bees was made and it was believed that they caused a minimum amount of injury. This class of pesticides was normally included in Group III – relatively nontoxic pesticides to bees (Atkins 1992)." Along with beekeeper applied acaricides, fungicides are among the most common types of pesticides detected in bees and bee products (Mullin et al. 2010), likely due to the application of fungicides during bloom when bees are present (Fell et al. 1983) to prevent numerous fungal diseases.

"Laboratory studies were conducted to determine the effects of incorporating selected almond fungicides into the diet of larval honey bees (Mussen et al. 2004). One-day-old larvae, from mixed Italian stocks, were grafted to basic larval diet or basic diet containing various fungicides. Experimental concentrations were calculated from field dose application rates of formulated product per hectare. Larvae were transferred to fresh diet daily and incubated in the dark at 35°C and 95% RH. After defecation, prepupae were moved into a dark incubator at 35°C and 75% RH. Mortalities of larvae, prepupae, and pupae were recorded daily. No larvae fed Captan, Rovral or Ziram completed development to adults. In the case of Rovral, a novel amorphogenic effect was observed. There were no significant differences in total mortality between the controls and larvae fed Abound, Elevate, Flint, Rally, and Vangard."

"Sublethal exposure to fungicides can affect honey bees in ways that resemble malnutrition. These include reduced brood rearing, queen loss, and increased pathogen levels. DeGrandi-Hoffman et al. (2015) examined the effects of oral exposure to the fungicides boscalid and pyraclostrobin on factors affecting colony nutrition and immune function including pollen consumption, protein digestion, hemolymph protein titers, and changes in virus levels. Because the fungicides are respiratory inhibitors, they also measured ATP concentrations in flight muscle. The effects were evaluated in three- and seven-day-old worker bees at high fungicide concentrations in cage studies and at field-relevant concentrations in colony studies. Though fungicide levels differed greatly between the cage and colony studies, similar effects were observed. Hemolymph protein concentrations were comparable between bees feeding on pollen with and without added fungicides. However, in both cage and colony studies, bees consumed less pollen containing fungicides and digested less of the protein. Bees fed fungicide-treated pollen also had lower (ATP) concentrations and higher virus titers. The combination of effects they detected could produce symptoms that are similar to those from poor nutrition and weaken colonies making them more vulnerable to loss from additional stressors such as parasites and pathogens."

"Commercial producers of honey bee queens have reported unexplained loss of immature queens during the larval or pupal stage. Many affected queen-rearing operations are situated among the almond orchards of California and report these losses in weeks after almond trees bloom. Almond flowers are a rich foraging resource for bees, but are often treated with fungicides, insecticides and spray adjuvants during bloom. Anecdotal reports by queen producers associate problems in queen development with application of the fungicide Pristine (boscalid and pyraclostrobin) and spray adjuvants that are tank-mixed with it. To test the effect of these compounds on queen development, a new bioassay was developed in which queens were reared in closed swarm boxes for four days, until capping, with nurse bees fed exclusively on artificially contaminated pollen. Pollen was treated with four concentrations of formulated Pristine (0.4, 4, 40 and 400 ppm), a spray adjuvant (Break-Thru, 200 ppm), the combination of Pristine and spray adjuvant (400:200 ppm), the insect growth regulator insecticide

Commercial producers of honey bee queens have reported unexplained loss of immature queens during the larval or pupal stage.

diflubenzuron (100 ppm) as a positive control, or water as negative control. Chemical analysis revealed that low concentrations of pyraclostrobin (50 ppb), but no boscalid, were detectable in royal jelly secreted by nurse bees feeding on treated pollen. No significant difference in queen development or survival was observed between any of the experimental treatments and the negative control. Only diflubenzuron the positive control, caused a substantial reduction in survival of immature queens (Johnson and Percel 2013)."

"Triazole fungicides affect honey bees by inhibiting cytochrome P450 monooxygenases that detoxify insecticides. These enzymes also detoxify phytochemicals, including the flavonol quercetin, in their nectar- and pollen-based diet. RNA-Seq analysis of bee larvae consuming quercetin revealed that it down-regulates multiple mitochondrion-related nuclear genes involved in energy production. Bees consuming quercetin together with the triazole myclobutanil produce less thoracic ATP and thus less energy for flight muscles. Therefore, agricultural use of triazole fungicides in combination with insecticides can potentially harm bees by compromising their capacity to extract sufficient energy from their natural diet (Mao et al. 2017)."

"Fermentation by fungi converts stored pollen into bee bread that is fed to honey bee larvae, so the diversity of fungi in bee bread may be related to its food value. To explore the relationship between fungicide exposure and bee bread fungi, samples of bee bread collected from bee colonies pollinating orchards from seven locations over two years were analyzed for fungicide residues and fungus composition. There were detectable levels of fungicides from regions that were sprayed before bloom. An organic orchard had the highest quantity and variety of fungicides, likely due to the presence of treated orchards within bees' flight range. *Aspergillus*, *Penicillium*, *Rhizopus*, and *Cladosporium* (beneficial fungi) were the primary fungal isolates found, regardless of habitat differences. There was some variation in fungal components amongst colonies, even within the same apiary. The variable components were *Absidia*, *Alternaria*, *Aureobasidium*, *Bipolaris*, *Fusarium*, *Geotrichum*, *Mucor*, *Nigrospora*, *Paecilomyces*, *Scopulariopsis*, and *Trichoderma*. The number of fungal isolates was reduced as an effect of fungicide contamination. *Aspergillus* abundance was particularly affected by increased fungicide levels, as indicated by Simpson's diversity index. Bee bread showing fungicide contamination originated from colonies, many of which showed chalkbrood symptoms (Yoder et al. 2013)."

"The effects of sublethal doses of deltamethrin, a pyrethroid insecticide and prochloraz and difenoconazole, two azole fungicides, on honey bee thermoregulation were investigated by infrared thermography of honey bees kept at 22°C. Deltamethrin at doses of 0.5 and 1.5 ng/bee did not elicit any significant effect on bee thermogenesis whereas doses of 2.5 and 4.5 ng/bee caused a severe hypothermia. Similarly, prochloraz and difenoconazole did not elicit any significant effect on thermogenesis at doses of up to 850 ng/bee whereas they triggered hypothermia at 1250 ng/bee. When associated with prochloraz or difenoconazole at 850 ng/bee, deltamethrin elicited a joint hypothermia at doses that did not induce a significant effect on thermoregulation when used alone (Vandame and Belzunces 1998)."

"There has been considerable concern over the last few years about the potential for synergism between pyrethroids and fungicides applied to flowering oilseed rape. Field data from honey bee poisoning incidents in the UK have shown that mixtures of pyrethroids with fungicides that are not synergistic under laboratory conditions have been involved. Thompson and Wilkins (2003) aimed to determine if the mixing of fungicides with pyrethroids alters the repellent properties of the pyrethroid and thus increases the risk to honey bees when applied to flowering crops. Interpretation and regulation may be difficult if it is unclear whether synergism or a change in repellency is responsible for the incidents. Synergy and repellency of realistic combinations of two pyrethroids and eight fungicides were tested. Synergy was tested using a standard acute toxicity test method and repellency was tested using a novel in vitro test method. The results showed that in vitro, certain combinations of pyrethroids and fungicides did significantly increase the risk posed by pyrethroids alone, due to a reduction in the repellency of the pyrethroid."

"Fungicide applications were made during apple (*Malus domestica* Borkch.), bloom to determine the duration of fungicide effects on pollen viability in the field and whether spray applications affect the foraging behavior of honey bees. Fungicide sprays did not affect the numbers of honey bees foraging on trees or their foraging behavior. Mean percent pollen germination was depressed to levels between 12.2 and 31.1% by Captan and to 29.5% by Dikar two hours after spray application. Recovery of pollen viability required 24 to 48 hours, depending upon orchard conditions. Benlate, Polyram, Baycor, and Topsin-M had no significant effect on pollen viability. The rapid recovery of pollen viability after initial spray applications and the lack of effect on flower visitation by

bees indicate minimal effects on pollination or fruit set under most conditions (Fell et al. 1983)."

"Almond growers face constant challenges to crop productivity owing to pests and pathogens, which are often controlled with a multitude of agrochemicals. For example, fungicides are often applied in combination with other products to control fungal pathogens during almond bloom.

However, the effects of fungicides on honey bee health have been so far understudied. To assess the effects of some of the top fungicides used during the 2012 California almond bloom on honey bee forager mortality, Fisher et al. (2017) collected foragers from a local apiary and exposed them to fungicides (alone and in various combinations) at the label dose, or a doses ranging from 0.25 to 2 times the label dose rate. These fungicides were Iprodione 2SE Select, Pristine, and Quadris. They utilized a wind tunnel and atomizer set up with a wind speed of 2.9 meters/second to simulate field-relevant exposure of honey bees to these agrochemicals during aerial application in almond orchards. Groups of 40 -50 foragers exposed to either untreated controls or fungicide-laden treatments were monitored daily over a 10-day period. Their results showed a significant decrease in forager survival resulting from exposure to simulated tank mixes of Iprodione 2SE Select, as well as synergistic detrimental effects of Iprodione 2SE Select in combination with Pristine and Quadris on forager survival."

"Fungicides triforine, triflumizole, and DuPont 6573, and the acaricide hexythiazox were tested for honey bee toxicity and effect on bee foraging and pollen viability in blooming apple and pear. None of the materials was toxic to honey bees or reduced bloom visitation. Only a high rate of hexythiazox significantly reduced apple pollen germination. Pear pollen germination was significantly reduced by triforine, hexythiazox, and triflumizole (Mayer and Lunden 1986)."

"The synergistic effect of a range of ergosterol-biosynthesis-inhibiting (EBI) fungicides and a pyrethroid insecticide was studied in the honey bee (Pilling and Jepson 1993). Various EBI fungicides were combined separately with the pyrethroid lambda-cyhalothrin at ratios derived from their recommended application rates to represent tank-mixing in the field. The mixture was then applied topically to the thorax of honey bees, and mortality assessed 24 hours post-treatment. All the fungicides tested increased the toxicity of lambda-cyhalothrin to honey bees. The fungicide propiconazole was found to have the strongest synergistic effect, decreasing the LD_{50} (lethal dose that kills 50% of population) of lambda-cyalothrin from 68.0 ng bee^{-1} to 4.2 ng, thus having a synergistic ratio of 16.2. Hazard ratios were calculated for lambda-cyhalothrin and fungicide mixtures using a recommended application rate of 7.5 g

Agricultural use of triazole fungicides in combination with insecticides can potentially harm bees by compromising their capacity to extract sufficient energy from their natural diet.

a.i. ha^{-1} (a.i.= active ingredient; ha = hectare). The hazard ratio for lambda-cyhalothrin alone was 110, but mixed with fungicide synergists, the hazard ratio ranged from 366 with flutriafol to 1786 with propiconazole. A blank formulation of a fungicide (without the active ingredient prochloraz) had little effect on the toxicity of lambda-cyhalothrin, indicating that it is primarily the fungicide active ingredient that is responsible for the synergistic effect."

"Chlorothalonil is a broad spectrum chloronitrile fungicide that has been identified as one of the most common pesticide contaminants found in managed honey bees, their food stores, and the hive environment (Mullin et al. 2010). While not acutely toxic to honey bees, several studies have identified potential sublethal effects, especially in larvae, but comprehensive information regarding the impact of chlorothalonil on adults is lacking. O'Neal et al. (2019) investigated the effects of exposure to a field relevant level of chlorothalonil on honey bee antiviral immunity and biochemical markers of general and social immunity, as well as macronutrient markers of nutrition and morphological markers of growth and development. Chlorothalonil exposure was found to have an effect on 1)honey bee resistance and/or tolerance to viral infection by decreasing the survival of bees following a viral challenge, 2)social immunity, by increasing the level of glucose oxidase activity, 3)nutrition, by decreasing levels of total carbohydrate and protein, and 4)development, by decreasing the total body weight, head width, and wing length of adult nurse and forager bees. Although more research is required to better understand how chlorothalonil interacts with bee physiology to increase mortality associated with viral infections, this study clearly illustrates the sublethal effects of chlorothalonil exposure on bee immunity, nutrition, and development." BC

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DOWNTOWN

Bee Sting Allergy Basics And Allergy Understanding For Beekeepers

It probably happens every time you talk to a group of people about beekeeping, whether it's family or friends, a garden club, a fair, or a lecture situation. A larger-than-possible proportion of those present tell you that they have a bee sting allergy, and some may tell you that they fear for their lives. You might be dubious, and you might roll your eyes when discussing it with other beekeepers, but are you going to tell a scared person that you don't believe them, or respect them as a human being who enjoys breathing? If nothing else, that's not a caring place to come from, or a great boost to beekeeping in the community.

What do you say to folks who claim a bee sting allergy? Remember, they are afraid of something pretty important, and you are not a doctor (well, *most* of you aren't). What do you *actually* know? And have you ever wondered about any danger to yourself or your family and neighbors, or made a plan just in case?

As an urban beekeeper in particular, honey bee sting allergy and the widespread fear of it seems like a potential risk to our neighbors that I need to know about, and something that beekeepers need to understand for themselves. We live in a world that is increasingly aware of and afraid of allergy, where people perceive allergy to be pervasive and increasing, and connected across all manner of health issues.

Is this true for us, as beekeepers? Is it something we should think twice about when placing honey bee colonies in urban or suburban locations? Three of my good beekeeper friends have received honey bee sting allergy diagnoses, and though I am sociable, I am not popular enough to have 3,000 close friends. It seems like more positive allergy tests than I would have expected! Allergy probably affects more than the one in a thousand I originally believed, but no connection of mine has experienced anaphylaxis (the life-threatening level of allergic reaction), either.

Dr. David B.K. Golden, *literally* the world authority on insect sting allergy, spoke with me (and is interested in learning from you, too) about bee sting allergy. This article hopes to help you understand and manage allergies to insect stings in a personal and practical way, and to be a good source of guidance to others. Just because I talked to a doctor, however, does not make this medical advice, and you really, truly need to see a trained allergist ***(allergist!)*** to help you work out your risk and possible treatment options if you are concerned.

You need some good news up front! Your chances, as well as those of your neighbors, of *dying* from a honey bee sting are somewhere between those of winning the lottery and getting struck by lightning. Don't get cocky: both those things happen, but you have the ability to reduce the chance that it will happen to you. And not-as-bad things can happen more often.

Before we continue, I need to ask you to memorize the following:

- Allergy is, by definition, a mistake your immune system makes when it treats something essentially harmless as a threat. Allergists are working to try to stop that. That solution's a way off, though;
- Having a positive allergy test/allergy in your system is not the same as being at high risk of a dangerous reaction;
- There are multiple kinds of reactions: **large local** reactions which *are not* systemic, **systemic reactions** which *are not* dangerous, and **anaphylactic reactions *which can take your life***. There's more later about the differences and triggers for getting help.

That last scary part was included and put in bold type on purpose. With bee sting allergy, folks often seem to veer between hysterical fear and complete complacency. Beekeepers seem to be vulnerable to the latter. Neither position is responsible or safe for you or the civilians around you (who are more likely to be among the terrified).

Allergy risk/understanding the numbers

Guess what? There is no fixed number for "who has a bee sting allergy" in the general public. It varies

Interview and Invitation To Work With Dr. David B.K. Golden.

Did you know that beekeepers frequently operate under a kind of self-immunization if they receive 50-100 bee stings over a year?

in different countries and at different times, linked to exposure. Beekeepers have more exposure, of course. According to Dr. Golden, "In testing the general public, allergists have found that about 20% of the public will have a positive allergy test, but only 2-3% said that they had had a systemic reaction in the past." Many of those folks who tell you that they are allergic had reactions that were not severe, and some may have had an allergy test…but if they never had an allergic reaction to a sting, that positive test still means that only about one in 10 of them is likely to have an allergic reaction of any kind, let alone a life threatening one.

"Those people who had a positive test (with no previous allergic reaction)? The allergy usually disappeared by itself in a few years, but, when it stayed positive and they got stung, there was at least an 85%-90% chance that they were not going to have a reaction and even less chance it would be severe! But *some* of them did. It's therefore possible for you to have been stung but never had a reaction, and still have a positive test."

Being stung sets the stage for a positive allergy test, though it doesn't substantially increase the odds of a future dangerous reaction. Dr. Golden explains, "Beekeepers absolutely will have a higher frequency of positive tests. That is NOT the same as being allergic."

Dr. Golden emphasizes that such testing should *follow* a possible allergic event, not be sought out ahead of time. "You may have been stung but never had a reaction, but you could nonetheless still have a positive test…though that test should never happen. Nobody should ever be tested if they have never had a bad reaction."

"In all allergies (it's not unique to insect venom) we don't know why most people who have the allergy in their system don't react. Lots of people have a positive test for cats or peanuts, but they have no reaction. That is the same for venom, if not more so – if we know someone has been stung recently, like in the past two to three months (or if they are beekeepers in season) the test can be positive in up to 40%!"

"That's a lot of people with the allergy in their system, but they have *no* history of having a systemic reaction to a sting. In this case, they can have a positive test, but have only a 5% to 15% chance going forward of having a systemic reaction."

This needs to be said, however: those with a positive allergy test face a greater risk than those who test negative for bee venom allergy. Dr. Golden adds this: "You know, even if the skin and blood tests should show negative in someone who had a severe reaction, the risk is very small but is still not zero because the tests are not perfect."

Common Sense Allergy Care

Because more than 85% of people who have never had an allergic reaction to a sting but have a positive allergy test will never have a systemic reaction to future stings, these folks may make medically unnecessary or even unproductive decisions. People who have had an allergic reaction may not have figured out its cause, as well, and may blame the wrong culprit. Human beings, and apparently beekeepers in particular, often take not-well-understood allergy information and run to unhelpful places with it. That might take the form of living with an exaggerated sense of risk, or an unwise sense of invulnerability. The truth is almost always somewhere in the middle.

For instance, did you know that beekeepers frequently operate under a kind of self-immunization if they receive 50-100 bee stings over a year? That's four to eight stings a month, or more likely a sting or two each week during the season in most places. If you (or your family members!) ever noticed that the first sting of the year, after a long winter, is noticeably more uncomfortable, and that later stings are easier to take, you might be experiencing self-immunization. However, the immunity you gain from stings during the season wears off during the sting-free winter. But if any sting starts closing your throat or makes you very light-headed, let an allergist do the immunizing. ***And don't wait.*** Dr. Golden says that we beekeepers often do.

What if you are having a dangerous reaction to a sting? What should you do? Yes, seek medical help for immediate treatment, but get to the best information as quickly as you possibly can *after* you have been to the emergency room. In one simply terrifying study of allergy advice in U.S. emergency rooms **(***Evaluating the management of anaphylaxis in US emergency departments: Guidelines vs. practice***, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4129832/**) fewer than 9% of ERs used current guidelines for diagnosing, treating, and follow up care for allergy and anaphylaxis. Please note: these are cases when people showed up at risk of death from allergy, and *fewer than 50%* were referred to an allergist or given a prescription for an EpiPen (or equivalent).

ER patients rarely receive reliable information on the source of their reactions, as well. According to Dr. Golden, **"**People will go to the ER with hives or an allergic reaction, and the doctor will ask, 'What did you eat?' The patient says, 'I don't know, three days ago I ate shrimp,' 'Oh that's it, it

Helping to answer the questions

Members of selected DC and Maryland beekeeping associations, you may be able to help Dr. Golden to develop a clearer picture of the actual level and dynamics of bee sting allergy in the larger beekeeping community! Shortly, the Center for Urban Bee Research will be sending a survey link to these groups. It is helpful to the research to know how many beekeepers were offered the opportunity to participate as well as how many completed the survey, so the project must reach out to limited, well-defined groups at this time (any information provided will be kept confidential and anonymized in the course of the research). Participating beekeepers located in the MidAtlantic region who are willing to be contacted may receive an invitation to receive a skin test for bee sting allergy and be compensated for time and travel.

was the shrimp! You can't eat shrimp anymore, or you will die.'"

"Twenty years later they come to me and say, 'I haven't eaten shrimp in 20 years,' and I say, 'Well, that probably wasn't the cause of your reaction.'"

"Every severe allergic reaction should be evaluated by an allergist and should be tested to confirm one way or the other. I don't care whether it is food or a drug or bee stings: if it is that bad, it needs to be correctly identified." Because remember, in this example a person had an uncomfortable or even dangerous reaction to something, no one helped them avoid that health risk in future, and they went forward believing that they were safe. Bad medicine. In the case of insect stings, too many people who have bad reactions say "I have had so many stings in my life with no reaction, so this must have been a fluke and will never happen again ."

At this point, all those frightened folks at your bee event might kind of make sense. A lot of them have been told that they are allergic, very few by a trained allergist capable of helping them evaluate what happened to them and their future risk. As beekeepers who understand this better, we might be in a position to help them out.

What are these reactions, anyway?

Most beekeepers are generally familiar with the distinctions between local and systemic allergic reactions. But let's go there, anyway.

Dr. Golden explains, "A ***large local reaction*** is where you get stung on your hand and the next morning you are swollen up to your shoulder. A huge swelling is a large local reaction, but it is not a systemic reaction."

"A large local reaction we can arbitrarily define as being six to eight inches in diameter or larger (that's pretty big), usually growing over 24 to 48 hours and taking five to 10 days to resolve. The big ones can be a whole arm or leg, and if it is on the head and neck it can be potentially threatening. But it doesn't build up fast, it builds up *slowly*."

"If you have had a large local reaction, and you are worried about a future sting causing anaphylaxis, I am going to tell you that you have a less than 3% chance. I am not going to recommend that you have tests, I am not going to recommend that you have shots, and I am even going to discuss with you whether it is worth getting an EpiPen (or similar) injector."

The other type of allergic reaction is ***systemic: it appears elsewhere in the body,*** not just at the sting site. Typically, a systemic reaction creates fear and concern that a potentially life-threatening allergy is present. Any kind of systemic reaction warrants a consultation with an allergist, but they don't all lead to Venom Immunotherapy (VIT), those injections of bee venom meant to immunize your system against the effects of bee venom.

There are different kinds of systemic reactions and they provoke different levels of concern. "The presence of hives and swelling on the outside of the body is not dangerous, though it is a systemic reaction… You could be covered in hives, but if there is no tongue or throat swelling, no breathing problem or nothing else, that's a systemic reaction, not anaphylaxis, even though it might seem pretty scary. How would I treat that? Actually, pretty much the same as a large local reaction."

"A large local reaction is caused by allergic antibodies, but those people usually *don't* get a systemic reaction to a future sting. Their risk of getting a systemic reaction is about 7%, less than half of which (3%) would be severe enough to use an EpiPen."

"***Anaphylactic reactions*** are systemic reactions that come on in *minutes,* 10-30 minutes after a sting, and typically can cause hives or swelling on the outside of the body, but also cause internal symptoms like swelling of the throat or trouble breathing or anaphylactic shock – meaning low blood pressure, dizziness, unconsciousness."

There are different kinds of systemic reactions and they provoke different levels of concern.

Hives are not always present in anaphylaxis! "If you get stung and you pass out and you don't have hives, some folks say, 'Oh that wasn't an allergic reaction because you don't have hives.' That would be a bad mistake."

But get this: "Of those with large local reactions, less than 3% will ever have an anaphylactic reaction to a sting. And that 'less than 3%' number is only slightly higher than the risk in 'the general population.'"

Therefore, having a large local reaction, while uncomfortable, is not predictive of a future anaphylactic reaction…and not having hives does not mean that you did not experience a multi-system, potentially anaphylactic reaction.

I know, this is hard, right?

Risk to the public?

Over the past few years, it appears that discussion and diagnosis of a wide range of allergies is increasingly common, and that raises fears of bee sting allergy in particular. Dr. Golden has participated in cases where these fears played a role in attempts to ban beekeeping.

"This actually comes up quite a bit in home owners associations and county councils, for example. In these cases, someone gets upset because they believe they are going to die, or their kid is going to die because their neighbor has a beehive."

"A township in Pennsylvania was on the verge of taking some very strong action and I was asked to comment by a reporter," and he found that the health and safety concerns raised by worried neighbors had no grounding in the facts.

"Realistically, if my neighbor has a beehive, what are the chances that they are going to get stung? Well, if they are tending their own hives, there is a very good chance that the beekeeper will be stung. What is the chance that I will get stung by my neighbor's bees? Actually, just a tiny bit higher than average (because I am closer to foragers). But a more significant risk may be that the beekeeper's neighbors are so afraid, that their actions could be agitating the bees…and there is most probably a negligible increased risk to anyone in the vicinity outside of, say, 50-100 yards."

"In the earlier case, one of the issues brought up was, 'My child is

Pretty much every other allergy problem seems to be increasing at an alarming rate, but insect sting allergy does not seem to be.

very allergic, and has allergies to so many things. If they get stung by a bee, I'm afraid that they will die!'

And I said, 'Well, just a minute.'"

"Insect sting allergy is not correlated with other allergies. You can have all sorts of allergies to cats and foods and a range of other things, and that does not mean that you are going to be allergic to stings." "Another issue in that case was, 'My child has a weakened immune system, (an immunodeficiency) and therefore they will die if they get stung.' There again, insect sting anaphylaxis *has nothing to do* with immune deficiency. A weakened immune system is not necessarily more susceptible to allergies. You are either allergic or you are not."

"The rate of insect sting allergy also seems pretty stable. Pretty much every other allergy problem seems to be increasing at an alarming rate, but insect sting allergy does not seem to be."

"Yet we have found on the other hand that we have a very poor handle on that. That's because it is kind of an invisible allergy. *We estimate that only one out of every ten people with an insect sting allergy ever gets to an allergist.* Most of them don't even tell their doctor."

"What we are more used to seeing is a person who has two or three or four reactions, then their family member drags them to a doctor's office. They say 'Well, I've been stung many times in my life with no problem, so I figured it was nothing. So what if I nearly died? I thought it could never happen again.' For some reason, if you had an itchy arm after eating a peanut, you would go to a doctor. But after a bee sting reaction, you don't. That's where we are at these days."

Are beekeepers at risk?

Developing an allergy to insect stings is related to exposure, and beekeepers certainly have that. If 3% of the general public reports a systemic allergic reaction to an insect sting at some time in their lives, it is likely that beekeepers will report a considerably higher number of reactors.

Some beekeepers obviously do become allergic and it is really not appropriate for them to try self-immunizing in the way mentioned earlier. Dr. Golden explains, "One of the problems with beekeepers attempting to self-immunize is that you have to build up your immunity incrementally in the beginning. You can't do that with self-stinging without possibly having a bad reaction." Also, they would have to continue to get regular stings through the winter to maintain the immunity and avoid a severe reaction to the first stings in the spring.

We mentioned earlier that there are large local, systemic-but-not-life-threatening, and anaphylactic reactions to bee stings. As a beekeeper (or member of a beekeeping family) who likely gets stung regularly, you might be wondering how to judge the symptoms you encounter and changes over time that you might observe. According to Dr. Golden, "If you have a large local reaction, you are still having an allergic reaction, but the likelihood of having a systemic reaction is still only in the 7% range. Many of those will not be anaphylactic. The likelihood of a reaction that requires treatment with epinephrine is less than 3% for those with large local reactions. It is also less than 3% for those with the so-called milder (non-anaphylactic) systemic reaction."

If you experience swelling, dizziness, or trouble breathing, you are deeply in the danger zone.

"It's when you get even the slightest reaction that affects tongue or throat or breathing, or causes light-headedness, however, that you have a sign that a future sting could be severe."

And take yourself to an allergist if that happens. If you experience tongue swelling, dizziness, or trouble breathing, you are deeply in the danger zone. In that situation, "The risk jumps by ten times, meaning that there is a 30-70% likelihood of a life-threatening reaction to a future sting."

"Sometimes the allergist and the patient have to have a discussion to decide whether it is worth being immunized if the reaction wasn't that bad. Certainly, with any degree of tongue or throat swelling or with any of those other reactions, it is advised."

"From my point of view, the treatment is so easy, safe and effective that it is crazy to take chances. So, it is easy for the beekeeper to get immunized and take the risk down to essentially zero."

But Dr. Golden does not pull punches on beekeeper allergies. "If someone needs to be on venom immunotherapy (VIT), they need to be on the full dose. In fact, with beekeepers I usually do a double dose. If an allergist is not able or willing to treat the patient up to the highest dose, they are not doing that patient any favors. They may actually be making an allergy *stronger*."

Dr. Golden offers, however, "If you look at 1,000 beekeepers (we don't have a number for sure) I would still expect to see only 4-5 times the likelihood of a systemic reaction: that still puts us only in the 8-10% range. Based on experience, I would estimate that about 5-10% of beekeepers will experience a systemic reaction." He would prefer *not* to estimate, though.

Going forward with better information

I've met too many beekeepers who experienced allergic reactions to stings to be able to ignore that there could be a risk to my family, my community and my neighbors, but (like beekeeping) the only way to make a safe assessment and good decisions is with clear and reliable information that you gather in advance. Dr. Golden has laid out a helpful map of risks, responses, and tools we can use to take care of

ourselves and those near us.

Dr. Jamie Ellis of the University of Florida also wrote an extremely helpful article that reviews additional information about bee sting allergy in the January 2016 issue of *The American Bee Journal*, and I highly recommend that all beekeepers review it, as well.

As a beekeeper, you could have a 10-times-higher likelihood of experiencing an allergic reaction than the general North American public, but that still puts you in a fractional minority. Your risk can change over time, though, so it is worth familiarizing yourself with bee sting allergy, and perhaps taking measures ahead of time – like requesting a referral to an allergist if you are becoming concerned about your reactions, or asking for a prescription for an epinephrine injector and getting training in its use. But remember insect sting allergies are not on the rise, or linked to other allergies or immune disorders, and we can rely on that information to calm fears. If people around you are not receiving good information from a trained allergist, encourage them to seek one out and learn more about their own well-being, and how our bees are a healthy part of it. BC

Toni Burnham keeps bees and does her best to educate the public in Washington, DC.

Carrying an EpiPen: Risks, Costs and Benefits

Whether or not you opt to make an epinephrine injector (of which the EpiPen is just one example) part of your toolkit, there's more to know on who is allowed to have them, what is available to you, how much they cost, the training needed to use a particular injector, and guidelines for when to use them.

Before you decide to carry an autoinjector, be aware that (due to a terrible incident in Virginia in 2012, where a school nurse refused to use an available EpiPen on a child in anaphylaxis) the "School Access to Emergency Epinephrine Act" now allows administration by trained personnel to a person in distress without an existing prescription. Many states are expanding this availability to sports and recreation venues, summer camps, movie theatres, and more. **https://www.aafa.org/epinephrine-stocking-in-schools/**. Please note, training both on the specific device and the indicators for its use is required: Dr. Golden suggests that beekeeping association meetings might consider asking for talks and training on this subject for their members.

"I have mixed feelings about [beekeepers carrying EpiPens]. Most of all, this goes back to training. If you came to see me and say that you are a beekeeper, and want to understand this tool, I will often end up agreeing to prescribe an epinephrine auto injector…*after* having had a discussion with you and training about when to use it, when not to use it, and appropriate recognition of anaphylaxis. In that case, you could save somebody else's life."

Buying an EpiPen

The EpiPen brand has become infamous in recent years due to Mylan Pharmaceuticals' decision to raise the price of the injectors from $100 to $700 for a set of two. Take heart: there are more options now, including some that may reduce your cost to nearly zero (with promotions from the manufacturer).

According to Dr. Golden, "The market for epinephrine injectors is changing rapidly – though nothing moves rapidly with the FDA – due to generics and competitors. They are still very expensive. For the most part, you can't buy one: you have to buy a package of two."

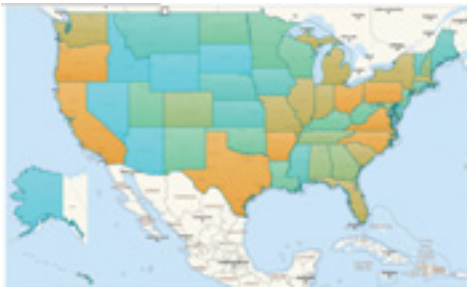
"There is an unbranded EpiPen available for about $300 for a pack of two, and a generic epinephrine auto-injector two-pack is also about $300 retail."

"There is a brand-new device which is just hitting the pharmacies, Symjepi, which is a pre-loaded syringe, and costs about $250 for a two-pack."

The Auvi-Q device has been available for quite a few years and has some unique features. Only Auvi-Q makes an epinephrine injector approved for children who weigh less than 25 pounds.

At the time of this writing, there is a low cash price injector called Adrenaclick from Impax Labs available at CVS Pharmacies! The CVS price is $110 for a two-pack, but the manufacturer is offering a coupon which may reduce the cost for commercially insured patients to $0, and $25 off for those paying out of pocket. **https://sservices.trialcard.com/Coupon/Epinephrine**

Towards Real Time *Varroa* Mapping



Research In Action

Andrew **Scott,** Joseph **Cazier,** Edgar **Hassler,** James T. **Wilkes**

In the last few *Bee Culture* articles, we have been profiling various technologies we deemed important steps on the path to a *Genius Hive* in a series we called *Technology in Action*. We may come back to this theme in the future as more technologies mature in this area, but for now, we plan to take a short detour and show promising research that features small but important steps on the path to the *Genius Hive*.

Recall that a genius hive is more than a smart hive. It is a hive that takes all the information from a smart hive, integrates best management practices and years of standardized data to guide beekeepers with real-time information that can help predict what the hive needs and optimize its output and productivity.

There are many researchers who are currently working on innovative projects that show the promise of contributing to a genius hive, but still need time, attention, and support to grow into commercially viable products. Our intent is to profile some of these projects here in the hopes that we can bring attention to them and speed these projects on their way.

We start by profiling a promising young researcher, Andrew Scott, a project leader at the Center for Analytics Research and Education, who is mining (anonymous) data from software applications, such as HiveTracks, to develop the proper procedures and framework for real-time mapping of *Varroa* and other bee diseases.

Know the Researcher

Andrew Scott is a graduate student working towards a *Masters in Applied Data Analytics* at Appalachian State University. He grew up in the coastal region of North Carolina and moved to the mountains for a change of pace after completing a degree in *Media Analytics* at Elon University. His speciality is in data visualization and media analytics. He was attracted to work with the bees out of a sincere desire to make a difference in the world.

In addition to his work on the *Varroa* study profiled here, Andrew is also working on two projects associated with the Food and Agriculture Organization of the United Nations, one related to data mining to identify best bee management practices and a related project in helping manage a global survey of different beekeeping practices around the world. His core passion is using technological tools to better communicate complex topics to lay audiences. These tools include visual analytics and film. Hopefully we will see some bee-related projects in film from him soon.

Mapping *Varroa*

For the current project, Andrew has been mining anonymized data from HiveTracks to lay the groundwork for real-time honey bee disease maps based on data collected in real-time from software systems. To understand this work, we first need to understand a little about data mining and the difference between *primary* and *secondary* data.

Data Mining

Data mining is the process of extracting data from various applications looking for nuggets of insight that can help achieve certain objectives. Sometimes, as in the case of research, the objectives are simply a better understanding of the subject. Other times it focuses on business objectives. Regardless, the important piece involves looking through data for useful insights.

Primary data

When most people think of research, they think of primary data collected for one purpose – its primary intent. This data generally has the advantage of being well defined, known and tightly controlled. All of which makes it good data for primary research. However, primary data also has several drawbacks. These include:

- *Cost*: It tends to be costly to collect primary data, which is one of the reasons research is so expensive.
- *Sample Size*: Primary research also tends to have small sample sizes because of the cost and effort involved. This can make it more difficult to detect an effect that can be generalized to larger beekeeping populations.
- *Confirmatory:* Due to the time and effort required, collecting primary data is risky. Researchers need to show a result for their efforts. Funders need to show results for their investment. For these reasons most researchers end up playing it safe by going for incremental improvements that confirm what

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Joseph Cazier, Ph.D is the Chief Analytics Officer for HiveTracks and Executive Director of the Center for Analytics Research and Education at Appalachian State University. You can reach him at **joseph@hivetracks.com**

Ed Hassler is an Assistant Professor in Information Systems and Chief Data Officer for CARE at Appalachian State University. You can reach him at **hassleree@appstate.edu**

James Wilkes is the Founder and CEO of HiveTracks and a Computer Science Professor at Appalachian State University. His lifelong passion for bees keeps fueling the development and mission of HiveTracks software. You can reach him at **james@hivetracks.com**

we already know or suspect, rather than riskier, but perhaps more promising, research in newer areas.
- *Slow*: Primary data collection tends to be slow, often taking years to reach conclusions and publish a study, again due to the time and expense.

Secondary Data

Unlike carefully laid out research trials that use primary data designed for collecting information for a given purpose, data mining uses secondary data that was originally collected for another purpose but has value for other applications, essentially recycling this data to multiply its value by addressing more than one problem at a time.

Secondary data has the drawback of being dirty in the sense that the design is generally not as clean given it was collected for a different purpose. Consequently it may not be as closely tied to academic theories or in the ideal format needed for analysis. This means that there is a lot more work (and we really mean a LOT) on the front end of a project in collecting, cleaning, adapting, and transforming the data to find what you are looking for. Of course, there is also a higher risk that the data will not be exactly what you are looking for.

However, there are also many advantages to using secondary data for research. These include:
- *Cost*: While the processing and analysis of the data can actually take more work due to the extra cleaning and preparing of the data, the cost of collecting the data can be much less. The reason is the data has already been collected for another purpose and exists. Therefore those with the proper skills (and permissions) can use the data to learn new things without the same costly up front collection.
- *Speed*: Since the data has already been collected, the speed of learning can be much faster, depending on the time needed to clean and transform the data.
- *Automation:* Since the data is already being collected for other purposes, and presumably will continue to be once the initial analysis is done, it can be automated to provide real-time information on an ongoing basis.
- *Surprising Findings:* Since there is less up front cost on data collection, researchers can look for and often discover surprising, unexpected findings, which can lead to innovative breakthroughs.
- *Size*: Generally, secondary data can be much larger, especially over time, than primary data, often by several orders of magnitude (100 or 1000 times the size). This size of the data allows for the use of innovative *Machine Learning* algorithms that require these large data sets. Machine Learning essentially read patterns in large data sets by developing new algorithms for that domain rather than just applying existing general algorithms from classical statistical techniques. This capability can lead to even more innovative breakthroughs.
- *Multiplicative Synergy:* Many times secondary data can be added to primary data or secondary data sources can be combined (i.e. hive strength, weather, crop area, diseases etc) in a way that greatly multiplies their value. This can make the data many times more valuable combined than when the data sources are separate; it can also make the data more valuable than the sum of the value of the separate data sources. Primary data researchers could greatly benefit from learning to include more secondary data sources in their studies.

With that background, let's now look at Andrew's study in a little more detail by looking at data from NASS.

NASS - National Agricultural Statistical Services (U.S.)

Andrew's study was inspired by data currently being collected by N.A.S.S., the *National Agricultural Statistical Services* arm of the U.S. government. Some beekeepers will recall that this group conducts a high quality statistical survey of various honey bee diseases from U.S. beekeepers with at least five or more colonies. This rigorous work provides a valuable service to beekeepers and policy makers across the U.S. and beyond.

This work can be quite laborious for them, as they need to call individual beekeepers around the country for regular updates and manually tabulate and statistically control the results. They then release the results several months later.

Some astute readers will note that the current U.S. Administration has cut funding for N.A.S.S., casting doubt on how much of this valuable work will be allowed to continue[1].

We wanted to see if we could build on their work by using secondary data from software systems like HiveTracks to gather comparable data in real-time. Andrew is focused on building a proof of concept for this from data we were able to pull in the system. This data is not intended to replace the work from N.A.S.S. but supplement it by providing real-time maps that can be released quickly to show where *Varroa* and eventually other diseases are present.

Note that this study is a proof of concept. It has a few clear and known weaknesses. The first is that the data for some states is small due to lower rates of data collection in those areas. This will be addressed over time as adoption grows, but for now it is hard to draw firm conclusions. The second is sample bias. We only have data from people who use the software, who may be different in some ways from those who don't. Finally, the data is not tightly controlled as it is a voluntary program.

Given the advantage of real-time data and the likelihood of an increase in users over time, most of these concerns will be addressed in the future. We hope the following study shows the promise of what this type of system could be.

Mining Maps

One of the first steps in creating the visualization dashboards was

[1]https://www.cnn.com/2019/07/06/politics/honeybees-study-usda-donald-trump-budget-cuts/index.html

ensuring that we were only working with hives that were considered active throughout the year of representation. We used the term "sentinel hive" to represent hives that had active data for the season. This involved looking at anonymous customer usage patterns to make sure this hive's data was being kept up to date in the system.

Next we looked for indications of various diseases and infections, including *Varroa*, as recorded in the data. We then tabulated information from the active hives where users recorded information about *Varroa* infestations. Because there is significant variation in disease prevalence and we wanted to show relative infestation rates based on realistic magnitudes, we next adjusted these to create a scale based on the normal distribution (a statistical technique useful to highlight events significantly different from the mean).

We then used these normalized scales to develop colored maps showing the relative infestation rates for different states in the U.S. at various points in time. Since N.A.S.S. reports their data based on quarters, we decided to do the same for this analysis.

The sentinel hives are mapped based on the state density of active hives (see Fig. 1). From there a color scale was built to show the change over time and was applied to each quarter with dark orange inferring a high percentage of inspections with *Varroa*, while the light blues had few inspections with *Varroa*. Some states have more hives due to population, software adoption rates, number of beekeeper etc. Note that nearly all of this data is from hobbyist beekeepers keeping fewer than 10 hives and the majority of users with one or two hives.

This population is very different from N.A.S.S. who tend to focus on larger beekeepers. These beekeeper groups (commercial vs sidliner vs hobbyist) often have very different beekeeping practices. Thus they can be expected to have very different and complementary results to N.A.S.S. and provide information that is often missing from the current discussion. Note that hives from one type of beekeeper can often share pests and pathogens with others.

Output

In the visual dashboards, one can see the changes across the continental United States throughout the four quarter cycle for the year 2018 (see Fig. 2). For the sake of brevity only one year's worth of analysis is included here, but data is easily accessible for both historical records and on a real-time basis.

During Q1 we saw a generally lower rate of *Varroa* infestations, with a few regional pockets of higher percentages. This could be explained by the early spring season being too cold for proper inspections and it being too early for the yearly Varroa growth and treatments needed.

Between Q1 and Q2 some significant growth in inspection rates are visible particularly in the Northwest and South. Overall the country is still seeing below average inspections with Varroa at this time (see Fig. 3).

There are only a few states that have an increased inspection presence between Q2 and Q3 in 2018 (see Fig. 4). This is alarming because one would expect beekeepers to be in their hives the most during this time period.

Lastly, the change from Q3 and Q4 in 2018 is very slim with only a few differences in inspection rates (see Fig. 5).

Why this matters to Beekeepers

As a beekeeper, knowing what is going on in the environment around you is invaluable. With a system similar to this, you could find a wealth of knowledge to then act on in the bee yard. With more detailed (and anonymized) data from more users, maps can be drilled down to the county level showing what is going on in the immediate vicinity.

You could also see when treatments and feedings are being applied and be more aware of the actions that are happening all around the hive. If you move your hives throughout the seasons, you can be more aware of what is happening in other locations and prepare for what is to come.

This simple visualization is only the beginning of what is possible with larger and even more reliable data. Next, the possibilities of the *Genius Hive* in the future.

Project Next Steps

An Automated Platform

- *Real-time*: One of the key features in the system created is the data processing in real-time, meaning there is no delay between the data being entered and being visualized. In an automated system, the key feature is that information can be passed from the beekeeper to all other users in no time at all, as opposed to waiting for months to get detailed information about pests, diseases, and treatment through national surveys and detailed reports. While these types of reports are critical for thoughtful and verified information that summarizes months of research, they do not add any timely insights to deal with a problem in the moment.
- *Sensors*: Details from automated systems like sensors can aid the human beekeeper in keeping records. Sensors can record hive temperature and weight in real-time, assisting beekeepers by giving information on the colony despite them being away from the yard.
- *Collaboration*: By sharing your

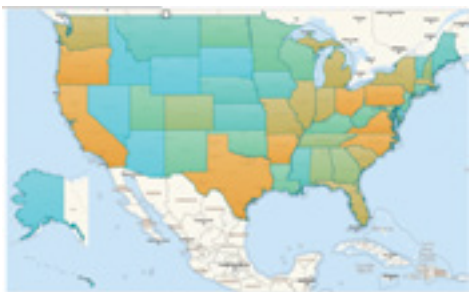

Figure 1. *Sentinel Hive Map*

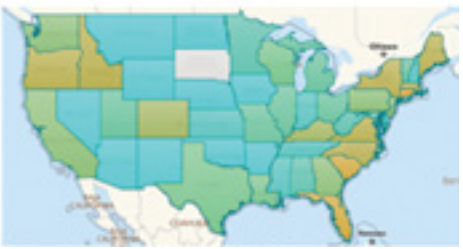

Figure 2. *Q1 2018 (January - March)*

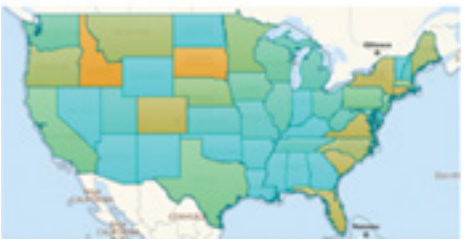

Figure 3. *Q2 2018 (April - June)*

information to the greater system, all users are able to contribute to the greater mission of protecting the bees while getting the benefits of insights on hives around them. This helps to make the greater web of beekeepers within the network smarter through combined knowledge and without delay.

- *Diffusion:* Another valuable feature of a platform like this is the wide-range dissemination of ideas and insights from the Genius Hive network. Users all over the world can search and explore the apiary management system to find actionable observations to apply to their own hives.
- *Privacy*: Privacy concerns can be accounted for by generalizing the location data from the specific address of yards to county levels, giving the system enough information to be beneficial for a user, but not detrimental for anyone's privacy. Additionally, this is enhanced by having an opt-in anonymous data sharing agreement, such as what HiveTracks has now.
- *Other Data Sources:* Ideally the system could also be expanded to include data from other sources, such as sensor data from companies like Arnia, Solution Bee, or EyesOnHives as well as other software platforms like HiveLog profiled in an earlier article in this series.

Conclusion

The sharing of data is how the entire ecosystem grows, just like in nature, one hive is dependent on others well-being for the greater good of the habitat. Beekeepers are able to take it upon themselves to be citizen scientists finding beneficial information from studying the successes and failures of others. Now imagine if policymakers are able to access this current state of the world system, they would then be able to make smarter decisions to help the bees before something tragic happens or be equipped with data to better understand anomalous or mysterious events like Colony Collapse Disorder in 2006.

In this study, we see the first steps toward the *Genius Hive* and discuss the potential benefits of a unified system worldwide. To build a system like this requires an immense amount of time. The system is built to be the sum of all its little parts, each entry is valuable.

In a global age, there are many people working towards the same goals, as we have detailed in the *Technology in Action* series, but putting all of these pieces of the puzzle together is key to creating a uniform and detailed final output. Having some sort of data standardization and combination is critical to future success.

We are currently searching for means of funding real-time interactive dashboards for bee diseases. Next, we continue this series by highlighting more research in action and how it can affect the beekeeper.

Finally, special thanks to *Project Apis m.* for supporting a portion of this work with a *Healthy Hives 2020* grant, to the leaders at the Center for Analytics Research and Education at Appalachian State University and **HiveTracks.com** for sharing their thoughts on this topic. Finally we also share thanks to the editors of *Bee Culture* for publishing this work. These efforts would not have been possible without visionary groups like those above providing support and resources. BC

Figure 4. *Q3 2018 (July - September)*

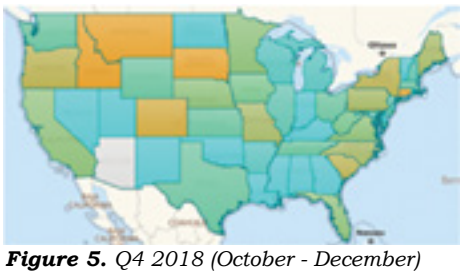

Figure 5. *Q4 2018 (October - December)*

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Andy **Card**

As a commercial beekeeper, I have to admit I was skeptical when news of resistant hygienic response to *Varroa* mites broke almost 20 years ago. After all, synthetic treatments worked, and thoughts of the degree of controlled breeding required to isolate and maintain the desired traits would be difficult to achieve. Non-hygienic drones from nearby beekeepers would dilute the traits, and treatments would always be required. Though we included hygienic breeders early in our queen rearing program, we performed little back checking to verify the presence of hygienic traits.

At the same time, we decided to limit the number of treatments to one synthetic and one organic treatment per year. While we have been able to maintain this limited treatment regimen for close to 20 years, we have learned that many beekeepers are resorting to multiple synthetic treatments per year to achieve control.

Can we achieve **real** Varroa mite resistance in our lifetimes?

In March of 2018 we invited Adam Finkelstein of VP Queen Bees to sift and select potential queen breeder stock from a random beeyard near Bunkie, LA. I was surprised how quickly he was able to find some queens with low enough mite counts in their populations to mark for future checking. Regardless of whether they made the cut later on I was impressed with their low mite counts over eight months after their last treatment. In April of 2018 we set up an experiment to mimic the natural free-fall or carry-out of mites from feral colonies in trees or buildings with completely open bottoms on pallets. Again, when we checked mite counts for the 27 colonies chosen at random during set-up, we were surprised to find several colonies with very low mite counts. I began to consider how we had conducted our queen rearing program so I decided to revisit the origins of our experience with the VSH program and the science which led to its development.

HISTORY

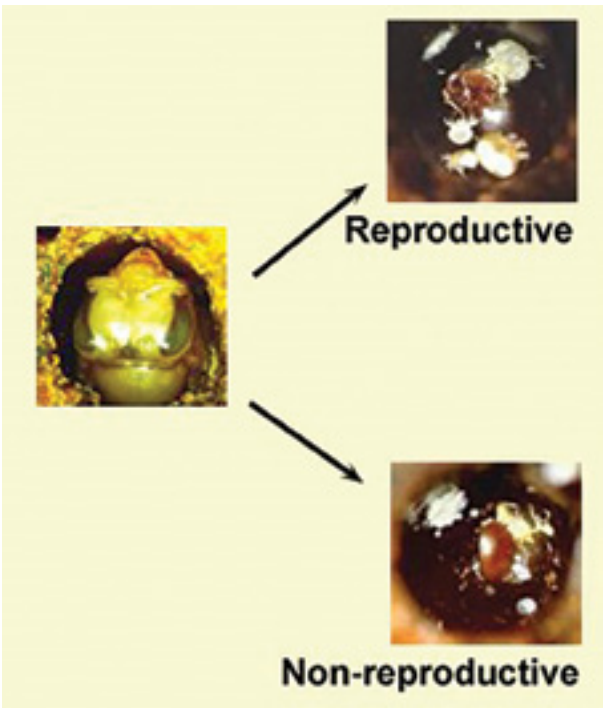
The hygienic response of honey bees to diseases and pests was explored as early as 1935 by Dr. Otto Park an Associate Professor at the Iowa Agricultural Experiment Station when the honey bee industry was in the grip of an American Foulbrood (AFB) epidemic. At a time when the sole remedies for AFB were shaking bees out of infected colonies and burning the hives, he proposed a genetic solution similar to the apparent success of other agricultural genetic solutions to diseases and pests at that time (Park, 1936).

In the late 1950s and early 1960s, a student of O.W. Park, Dr. Walter Rothenbuhler at Ohio State University, wrote a series of papers identifying the genetic basis of the hygienic trait responsible for suppression of AFB. The significance of this important discovery was overshadowed by the apparent success of sulfa drugs and antibiotics in treating foulbrood. Most importantly, the precedent for discovery of a genetic remedy for *Varroa destructor* would be rooted in over 30 years of observation and experimentation of hygienic behavior with respect to AFB. It would take another 30 years and the arrival of *Varroa* mites in the U.S. for the lessons learned to be applied again.

More recently, Spivak (1996) describes general hygienic behavior as effective in removing freeze-killed brood and including *Varroa*-infested brood. Several pathways or cues including those chemically mediated (olfactory), mechanical (lack of movement), and thermal (freeze killed) suggesting chemical mediation to be the most probable pathway for *Varroa* resistance (Spivak and Gilliam 1998). Almost concurrently, the Suppressed Mite Reproduction (SMR) trait which involves the breaking of foundress mite reproduction cycles due to removal of pupae by honey bees sensing the presence of mites in the brood, was identified by Harbo and Hoopingarner (1997) with a controlled experiment using queens raised from bees exhibiting good hygienic behavior coupled with artificial insemination of each queen with a single drone. Single-drone insemination results in populations where 75% of the workers are directly related to each other (as opposed to genetically diverse colonies from queens mating with multiple drones in nature) making it easier to isolate desired traits (Rothenbuhler 1964). The presence of the SMR trait was verified by microscopic examination "in the laboratory" of pupae and inventorying mite progeny to determine the status of mite reproduction. It would take about eight years to rename the SMR trait, now traceable to the hygienic behavior of worker bees seeking and removing *Varroa* infected pupae, to VSH (*Varroa* sensitive hygiene) (Harbo and Harris 2005).

The impact and acceptance of these important discoveries was only moderate according those close to the program probably due to the relative success of chemical remedies, coupled with logistical difficulties

surrounding stock maintenance and verification including tedious lab procedures.

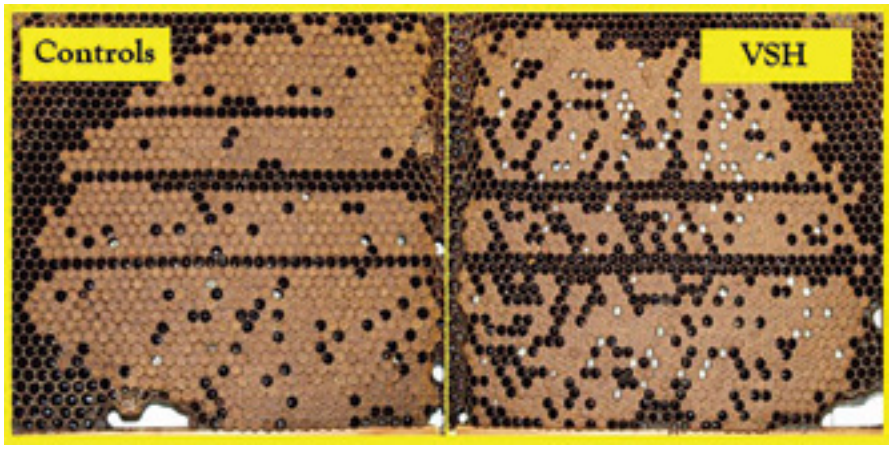


PROVING GROUNDS

Following repeated verification that they had the "right stuff "genetically, the USDA group at Baton Rouge, who discovered the key role of non-reproducing mites in supporting *Varroa* resistance, set about testing practical, "real world" applications for VSH stock. Since much of the previous experimentation had been short term, a three-year experiment was designed involving a group of beekeepers from Alabama. The results showed that untreated VSH bees maintained lower mite populations, therefore requiring fewer treatments than Russian stock or the control Italians. The Alabama tests also showed that VSH stock provided good mite control in a low stress environment involving stationary colonies for honey production (Ward et al 2008).

In 2008 scientists at USDA Baton Rouge attempted to confirm the suitability of known VSH/SMR stocks for high stress beekeeping applications involving long distance transportation to multiple crops often characterized by poor nutrition from crops visited, exposure to pesticides and fungicides as well as *Varroa* mites from other commercial beekeepers and their "in hive" remedies.

The first trials involved participation of a highly migratory commercial operation based in Louisiana. This field test used VSH queens outcrossed with drones provided by the collaborator's "control" stock. These outcrossed VSH bees had a low *Varroa* infestation level at the end of the test comparable to the treated controls vs. the untreated non-VSH controls. These results were verified over a three-year period in which test colonies were monitored through the pollination season involving almond, apples, blueberries and cranberries as well as limited honey production in western New York. The experimental design included VSH queen cells grafted from breeding material provided by Glenn Apiaries of Fallbrook, CA, and the USDA laboratory, pure Russian queens from several commercial sources as well as control Italian colonies provided by the cooperator. Mite loads for the VSH outcross colonies (untreated) were comparable to treated controls (Danka et al. 2012). Subsequently, queen stock selected from the most populous colonies coupled with the lowest mite loads among the test colonies were used to provide the genetic base for a new honeybee stock, which would come to be known as the Pol-line (Danka et al. 2015). Verification of these results would continue over a six-year period and would eventually include beekeeping operations focused on western honey production and almond pollination migratory routes (Rinderer et al. 2014).



AVAILABIITY

In 2013, the USDA established a technology transfer agreement with VP Queen Bees of Iva, South Carolina where actual VSH queen stock was received from the USDA Baton Rouge laboratory following the retirement of Tom and Suki Glenn in California. (Glenn Apiaries previously had distributed VSH breeding material.)

VP Queen Bees' current approach, which they refer to as VSH Pol-line 2.2 involves development of mite-resistant breeder queens with procedures similar to those used by the USDA laboratory in Baton Rouge regarding development of the Pol-line stock. Cooperating commercial operations provide queens from select colonies with low mite loads and high honey production. Potential queens are tested, cells raised and breeding controlled with instrumental insemination resulting in breeder stock with highly expressed VSH traits.

Lamb's Honey Farm of Jasper, Texas remains a contributor to the VP Queen Bees program. They have developed a method of in-yard selection of mite resistant bees via the alcohol wash technique by screening the best four hives in each yard making production a priority along with low mite loads.

Further breeding for VSH based *Varroa* resistance is occurring in a public-private partnership headquartered at the Hawaii Island Honey Company, near Hilo, HI. Pol-line semen from bees maintained by the USDA laboratory at Baton Rouge is used in single drone inseminations to fast track selection of the VSH traits. The resulting expression of mite resistance in populations is confirmed by field and lab testing methods developed by scientists at the USDA laboratory in Baton Rouge. Confirmation testing is labor intensive and not particularly well adapted to normal commercial queen-rearing operations. The importance of this program and the stock it seeks to produce cannot be overstated. Commercial availability of mated queens and breeder queens is expected in the near future.

MERRIMACK VALLEY APIARIES and EVERGREEN HONEY CO.

For over a decade we have been closely involved with the USDA laboratory at Baton Rouge, LA. We were the cooperators (as previously mentioned) in the first VSH functionality test involving nationwide crop pollination, between 2008 and 2010. We were early recipients and testers of varroa resistant Russian queens, and we were among the first to receive some of Dr. Spivak's Minnesota Hygienic stock, as well as breeder queens from Tom and Suki Glenn, who were the first recipients of VSH and Pol-line breeding material from Baton Rouge and in fact, named the Pol-line stock. In 2018 and 2019, we provided test queens for VP Queens Bees.

We are convinced that long term positive results are possible but will require participation and patience.

Currently we produce 30 to 50 thousand queen cells per year for our production hives and our "for sale" nuc program. We have a very aggressive re-queening program attempting to re-queen over 30,000 colonies approximately 1.66 times per year. Due to our large yard sizes (72 to 96 colonies per yard) we flood the immediate area with our chosen queen cells crossed with our drone stock following protocol called for by Spivak and Gilliam (1998), which calls for natural breeding of queens selected for hygienic qualities with resident drones.

After early emphasis on mite resistance in our breeding program, we followed up with breeders from Ohio Queen Breeders providing excellent production stock, while making no claims of resistant traits. Despite crop pollination exposure to many different mite populations from different beekeeper treatment strategies, we have avoided catastrophic *Varroa* epidemics and the effects of "mite bombs," an example of horizontal mite transmission. The term horizontal transmission (Schmid-Hemple 2011) refers to mite spread from hive to hive due to beekeeping management practices; pollination proximity, holding yards, uniting of queenless colonies, etc. Horizontal transmission of mites is considered more virulent than vertical (mother to daughter) transmission (Fries and Camazine 2001; Seeley and Smith 2015).

The strength of our breeding program lies in a degree of *Varroa* resistance, while not highly expressed, that is confirmed by reduced frequency of treatment required for mite control. Reduced frequency of treatment is essential to allow the natural resistance traits to be better expressed (Spivak and Gilliam 1998; Locke 2016). Reliance on chemical remedies is counter-productive to natural selection pressure, and can ultimately cause more damage to bee health (Haarman et al. 2002; Johnson et al 2009; Locke 2012). As stated previously, our success in avoiding catastrophic losses is the result of minimal treatment frequency even when mite loads exceed recommended treatment levels. Significantly, the African honey bee, *Apis mellifera scutellata* normally carries and controls *Varroa* mites at the level of three to four mites per hundred bees (Locke 2016), a level which triggers recommendation for treatment in European honey bees. It also follows that if mite resistant bees require and receive less treatment, then mites should retain susceptibility to the treatments, therefore reducing the potential to develop resistance to these materials. Reduced treatment strategies require careful mite load monitoring for success.

FAST FORWARD

Beekeepers have options as to the development of their own VSH stock. Breeders are available from VP Queen Bees now and are expected to be available from the Hawaiian breeding program which also expects to sell mated production queens as early as 2020. It would be helpful to have increased verifiable certification of commercial queen producers due to the complexities involved in isolating hygienic traits. The alternative to purchasing these genetics is to adopt techniques exemplified by Lamb's Honey Farm, also a commercial queen producer, which identify best producers with lowest mite loads and breeds from them. The benefit of this system lies in the emphasis on honey production as a primary qualifier.

We are convinced that long term positive results are possible but will require participation and patience. Claims will be made that will not always prove evident. Improvement will likely be gradual and sometimes seem nonexistent. The first step is to understand the science that has shown it can be done.

The practical application of varroa-resistant bees is perhaps the most important tool for the beekeeping industry to combat mites in combination with minimal treatment. In our beekeeping system at MVA/EVERGREEN, timing trumps mite loads, but there must be some degree of resistance in order to minimize treatment!

A clue to resistance with respect to *Varroa* mites is illustrated by the Asian bee, *Apis cerana*: these bees and varroa co-evolved and hygiene and grooming developed over the millennia to allow *Apis cerana* to keep mites at low, non-threatening levels (Peng 1988). It is significant that mite resistant populations of honey bees found around the globe, when exposed to mites have shown natural adaptation without interference from typical apicultural practices, including chemical treatments. If we supply highly expressed, hygienic, *Varroa* mite resistant traits to U.S. honey bee populations while allowing some minimal treatment, can we have effective *Varroa* control in our lifetimes? If VSH is the bicycle leading us to mite control and treatment is the training wheels, let's all hope for the day when we can say, "Look Ma, no wheels!!" BC

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Colony Management After The Honey Flow

Lloyd **Harris**

Figure 1. *Experimental colony's general appearance.*

Dividing colonies in half to produce two colonies from one colony before Winter appears to be a practical and easy way for beekeepers to: 1) expand the number of colonies they manage, 2) produce new colonies for sale in the Spring, or 3) replace colonies that die during Winter and early Spring. Splitting colonies in half after the honey flow to form two colonies is a possible solution to deal with colony loss during Winter.

How many bees does a colony need if it is going to survive a temperate climate Winter and produce a productive colony the following year? The answer depends on where the colony is situated and how much management it receives.

The information presented in this article is directly applicable to colonies situated on the Northern Great Plains of North America. However, the concepts discuss edshould be applicable to managed colonies elsewhere. The information presented herein may change the way you manage your colonies prior to Winter.

On the Northern Great Plains of North America, the annual honey flow ends sometime between mid to late August and the end of September in most apiaries. The exact date depends on which crops were grown within a colony's foraging range and the prevailing weather conditions that occur during this period, especially the occurrence of the first killing frost.

Once there has been a killing frost, the honey flow quickly becomes a trickle and then colonies begin consuming more honey than they are collecting. Once the honey flow is over, most colonies contain tens of thousands of foragers that are no longer needed. Instead of adding to their colony's honey stores, these excess bees begin consuming pounds of honey their colony needs if it is going to survive Winter. Instead of being a colony asset, these bees quickly became a colony liability. Their value to the colony suddenly becomes questionable.

Most beekeepers seem to be either unaware that their colonies are filled with tens of thousands of bees that their colonies no longer need or they are not prepared to utilize these excess bees.

Some beekeepers may even believe that: 1) these excess bees are still needed because they will eventually form part of its winter colony, 2) these large populations are required to rear the winter colony, or 3) these bees are required for a colony to survive the pending sub-zero Winter weather conditions.

Unfortunately, none of these opinions are true. Very few, if any, of the adult bees present in a colony in August will actually participate in the Winter colony (Harris 1980, Mattila et al., 2001, Harris, 2008a; Harris, 2008b; Harris, 2017). Only a very small portion of them are actually needed to produce the bees which will eventually form the Winter colony. In addition, the Winter colony usually contains substantially fewer bees that the 30,000 bees recommended by Farrar (Farrar, 1952).

Just how many of these bees are actually surplus and unneeded is debatable. However, in very large colonies, there could be as many as 20 to 40 thousand surplus bees. The remaining 15 to 20 thousand bees should be more than adequate for a colony to maintain its normal seasonally related brood rearing pattern without significant interruption. After all, a colony's brood production after the end of August is comparable to or less than that produced by colonies initiated with two or three pounds of bees (ca. 7,000 – 10,500 bees @3500 bees per pound) in early Spring (Smirl and Jay, 1972; Nelson and Jay, 1972; Harris, 2006). In addition, brood production after the end of August appears to be more of a function of its queen's age (Farrar, 1952; Cale, 1956; Free and Racey, 1968; Harris, 2008b) and pollen availability (Mattila and Otis, 2007) than colony size.

So, there is the problem. It occurs near the end of every Summer every year. After the honey flow is over, most colonies contain tens of

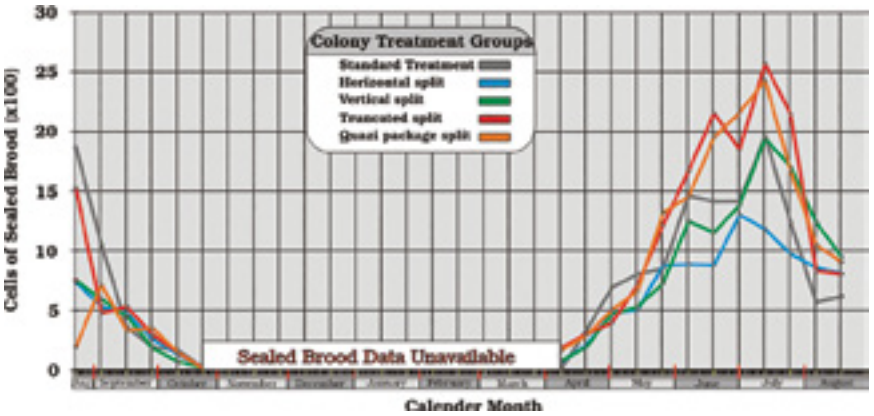

Figure 2. *Seasonal changes in colony sealed brood production from the 23rd of August 2013 to the 30th of August 2014.*

thousands of bees that are no longer need and which have ceased to serve a useful function. These bees just loiter around until they die. Most, if not all of them, die before they transition from short lived "Summer bees to long-lived "Winter bees" which occurs sometime between late September and the middle of October (Harris, 2016).

After the honey flow is over, a typical colony will gradually become less populous; losing about 500 or more bees every day until they attain a relatively stable population during late October of between 12 to 20 thousand bees (Harris 2008a, 2008b). The larger a colony's adult bee population is at the beginning of September, the greater the daily bee loss rate per day will be.

If this is what normally occurs after the honey flow is over, why not just reduce a colony's population to its Winter population level immediately by either getting rid of these excess bees or by using them to establish new colonies?

Think about it. These new colonies could be used to replace colonies that normally die during winter or to provide additional colonies for sale next year.

To address this issue of what to do with the excess bees present in colonies at or near the end of the honey flow, a small preliminary research project was undertaken to collect some data regarding this matter.

Experimental Design: This experiment was designed to reflect how a commercial beekeeper might implement the procedures. All that was required of a colony to be included in the experiment was that it had a mated queen and had an acceptable/ normal population which would not require the beekeeper/experimenter to assess a colony's population strength by examining ever frame. The selected colonies occupied at least two standard Langstroth hive bodies and contained 18 to 20 frames covered with bees (See Figure 1).

The experimental colonies were obtained from several different commercial apiaries. Colonies that were not already present at the Winter apiary location were transported at night and arranged into their respective treatment groups. These colonies were not randomized between treatments nor where they equalized in any manner.

The queens in the various colonies were of unknown age, except those 1) in the "Standard" treatment colonies which where reared in May of 2013 and 2) colonies requeened in late August with queens reared in July 2013. All other queens had been reared prior to 2013 from stock selected by the beekeeper.

Experimental treatments: The main criteria for the experimental treatments were that the treatments could be: 1) implemented quickly, 2) required minimal effort, and 3) could be accomplished by individuals with little or no beekeeping experience. The experimental colony received either the beekeeper's normal/ standard pre-Winter management treatment or they were split in half to form four variations of a mother and daughter colony combination.

The five treatments were:

1) the "**Standard" treatment** - These colonies (n=11) were moved to the Winter apiary site on the evening of 27 August and received the beekeeper's *standard winter* preparation treatment.

2) the ***"Horizontal split"*** **treatment**- These colonies (n=8) were formed by dividing four standard pre-Winter colonies in half; by alternatively transferring frames of honey, bees and brood from the parent colony into two standard Langstroth hive bodies. After dividing these colonies into a mother and a daughter colony, the hive bodies were then temporarily placed back on the colony's bottom board. If a colony's queen was located, it was placed in the lower hive body and a queen excluder placed between the two hive bodies and the lower hive body marked to indicate the queen's presence. If the colony's queen was not located, the lower hive body was not marked.

In the evening, after the bees had stopped flying; the top hive body/ daughter colony was removed and provided with its own bottom board, lid, and a caged queen if the colony's queen had been previously confined to the lower hive body. The mother and daughter colonies were then relocated to the Winter apiary.

Colonies with unknown queen status were inspected after three days and queenless daughter colonies were provided with a newly mated caged queen.

3) the ***"Vertically split"*** **treatment** – These colonies (n=20) were formed by dividing 10 standard prewinter colonies in half by transferring frames alternatively from each parent colony to form a mother and a daughter colony as in ***"Horizontal split"*** *colonies*, except the frames were placed into two standard Langstroth five-frames hive bodies instead of standard 10-frame Langstroth hive bodies; to produce two side-by-side colonies occupying the same physical location as the original parent colony.

These colonies were prepared by placing the parent colony on the hive lid directly in front of its previous hive location. Two five-frame hive boxes were then placed side-by-side on the colonies previous location. Frames containing honey, bees and brood from the parent colony were then alternatively transferred into the five-frame hive boxes to produce a new mother and daughter colony combination.

The lower five-frame hive body received two frames with honey placed on either side of three centrally placed brood frames. The upper five-frame hive body received the remaining frames with any additional brood frames placed above those in the lower hive body. As the brood frames were being transferred into the five-frame hive bodies, they were quickly assessed for brood diseases and the presence of eggs or larvae to confirm the presence of a queen. If the queen was located when the frames were being transferred, the colony's hive body was marked to indicate that it contained the old queen and was designated as the mother colony. The queenless daughter colony was provided with a caged newly mated queen.

4) the ***"Truncated colony"*** **treatment** – These colonies (n=4) were formed by dividing the standard pre-winter colonies in half by removing their upper standard Langstroth hive body. The parent/mother colonies retained all the adult bees contained in the lower hive bodies and all the brood except for one frame with open brood. A queen excluder was then placed above the lower hive body. One frame with open brood was placed into the colony`s upper hive body and the colony`s lid replaced.

On the evening of 23 August, the upper hive bodies along with their frames, bees and its one frame with open brood where removed from the parent colonies and provided with their own bottom board, lid and a caged queen. The mother and daughter colonies were then moved to the Winter apiary.

5) the **"Quasi Package" treatment** – These colonies (n=4) were the daughter colony produced by removing the upper standard Langstroth hive body from the ***"Truncated colony"*** treatment. These colonies contained half of the adult bees from its parent colony (ie the excess bees) but only one frame with open and sealed brood and a newly mated caged queen. These colonies would have been comparable to starting a new colony with about four or five pounds of packaged bees (ca. 14,000 bees), a newly mated queen and a frame of brood in various stages.

General Colony Management: Colonies were provided with waxed inner covers on 4 September to provide colonies with a top entrance and a centrally located hole through which the bees could access an inverted pail of medicated sugar syrup placed above each colony.

An empty hive body was placed on top of the inner cover and a two inch thick rectangular Styrofoam® block containing a centrally located two-inch diameter hole was placed into the empty hive body. A feeder pail containing medicated 1:1 sugar syrup was then inverted and placed above the centrally located hole in the Styrofoam®. Each colony was supplied with 12 litres of Fumagilin B® medicated syrup (@ 5g. formulated product/L.) and treated with Apistan® mite control stripes on 14 September 2013. Although not recommended, the Apistan stripes were not removed until 14 May 2014 the following spring due to cold weather conditions which occurred during October.

Colonies were wrapped for Winter on 25 October 2013. The colonies were wrapped with standard commercially available black insulative wraps and provided with nine inches of insulation above their inner-cover except for the vertically split colonies. The "vertically split" colonies were wintered with two colonies per Styrofoam® insulative carton that where covered with black, plastic, stretch-wrap film.

On 8 April 2014 and 20 April 2014 colonies were temporarily unwrapped examined and provided with: 1) Global's pollen supplemental strips containing 15% pollen and 2) eight liters of medicated 2:1 sugar syrup. The winter insulative packing materials were not permanently removed until 2 May 2014.

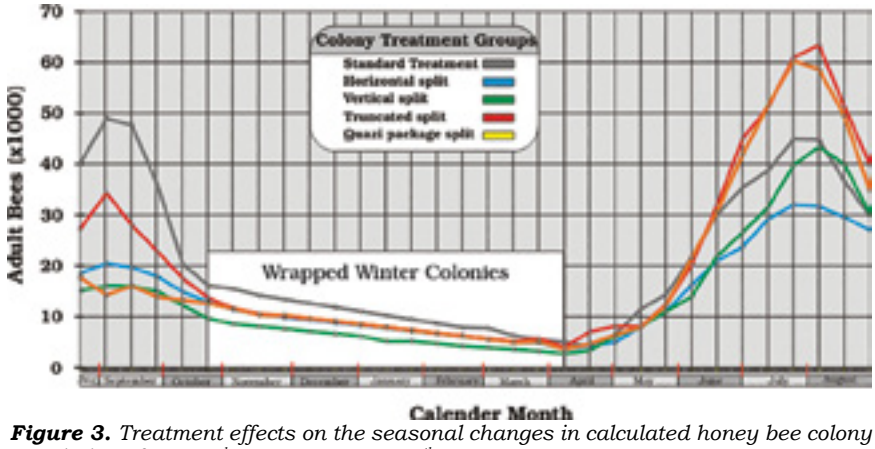

Figure 3. *Treatment effects on the seasonal changes in calculated honey bee colony populations from 23rd August 2013 to 30th August 2014.*

Colony Population Estimates: The Liebefeld/Oregon State University full frame holding capacity methodology was used to estimate each colony's initial adult worker bee population (Gerig, 1983; Burgett and Burikam, 1985; Imdorf, et al., 1987, Imdorf and Gerig, 2001).

Subsequent colony population estimates used the Harris population estimation procedures (Harris, 1985), which treated the developing colony as being composed as a series of worker bee subpopulation. Each subpopulation's size was derived from the survival of sealed brood estimates taken at regular 12-day intervals.

Sealed brood area was estimated by superimposing a grid containing an array of one-inch squares over the sealed brood (Nolan, 1925; Farrar, 1931; Moeller, 1952). These area estimates were subsequently multiplied by 27.75 to converted sealed brood area estimates to numerical cell estimates.

Egg and larvae estimates for each subpopulation were back-calculated using the assumption that the egg stage lasts three days and the larval stage lasts six days. Egg, larval and sealed brood survival rates were those observed by Sakagami & Fukuda (1968).

Adult bee survival was determined from a series of newly emerged workers that had been individually marked with a different color of fluorescent paint (Harris, 1979), which coincided with when the associated subpopulations were estimated from sealed brood. When worker bee survival data was not available, their survival was estimated from life table data (Harris & Harris, unpublished).

Winter food consumption: Colony Winter honey consumption was determined from individual colonies weighed on 25 October 2013 and again on 2 May 2014.

Tracheal mite, *Varroa* mite & *Nosema*: Tracheal mite, *Varroa* mite, & *Nosema* infestations were assessed from adult bee samples collected in alcohol from each colony's respective brood area on: 4 September 2013; 14 May, 2014; and again on 30 August 2014.

Results and Discussion: The reported results are preliminary. They reflect the various management methodologies used, which may not have always been based on an adequate understanding of their direct or indirect consequence on bee behavior and biology.

The experimental colonies were evaluated based on: 1) sealed brood production, 2) colony size 3) colony survival, 4) food consumption during winter and 5) honey production during the summer of 2014.

Sealed Brood: Seasonal changes in sealed brood production are shown in Figure 2. Colony sealed brood production trends were initially as anticipated. Colonies receiving the standard management practices, initially contained more brood than colonies that had been divided in half, but only for the first 12 days after which brood production was similar in all colonies.

Figure 2 does not report on brood production after 10 October 2013 and before 8 April 2014 but only because of weather conditions did not permit data collection. It is likely that these colonies contained small amounts of sealed brood on 22 October and that wrapping them for Winter would have stimulated additional brood rearing (Harris, 2008a. 2008b, Dooremalen et al 2012). Because bees reared after October are believed to be long-lived "Winter bees", brood production after 10 October may have produced a small increase in colony size.

Although brood production was not monitored throughout the Winter, it is likely that these colonies would have reared brood but perhaps not to the same extent reported for colonies stored in indoor wintering facilities (Harris, 2009).

On 8 April 2014, all treatments, except those receiving the "Standard treatment", contained small amounts of sealed brood, which indicated that brood production had resumed by at least mid-March or earlier.

During June and July 2014, sealed brood production was unexpectantly and unexplainably higher in colonies that had received the Truncated split and the Quasi package treatments than in colonies that had received the other treatments. Perhaps this was a function of: small sample size, exceptionally prolific queens in these treatments, or colony management practices.

Colony Size Adult Populations Adult Colony Population: Seasonal changes in colony adult bee populations from June 2013 through early August 2014 reflected the sealed brood production observed in Figure 2 and are shown in Figure 3. Because these population estimates are based on: 1) sealed brood production (see Figure 2), and 2) adult worker bee survival; colony population estimates during Winter and early Spring were underestimated by the amount of brood that colonies would have reared between mid-October and early April when they could not be inspected.

Although, Figure 2 does not show any sealed brood production during the "Winter period, it likely occurred at some level and would have contributed to larger populations during Winter than what is depicted in Figure 3. However, rather than speculating on how much brood colonies actually produced during this period and its effect on colony development, Figure 3 shows what would have happened had colonies not produced any brood during this period.

However, visual colony population assessment in Spring suggested that colony populations were larger than predicted in Figure 3. Based on the Spring colony population visual observations, the only possible conclusion would be that the assumption that colonies were broodless during Winter was wrong, except for colonies that were queenless during the Winter or contained no pollen after the end of October 2013.

If these colonies were able to rear brood at rates similar to those observed by Harris (2009), these colonies should have been able to have replaced most of the dying bees and stabilized their populations at levels similar to those observed in late October or early November. All that would be require for this to occur would have been an average daily production of between 25 to 50 new bees per day between mid-October and early April.

Winter & Spring Colony Loss: Colonies were initially examined on 8 April 2014 to determine whether or not they had survived the Winter and to quantify the amount of sealed brood each colony contained.

Initial colony mortality on 8 April 2014 was quite variable between the five treatments; ranging from zero to 25 percent. Of the 47 experimental colonies, five colonies had died and three additional colonies were queenless. The "problem" colonies were subsequently inspected to ascertain possible factors that might have contributed to their dying or becoming queenless.

Of the five dead colonies, two colonies belonged to the "Horizontal split" treatment and three colonies belonged to the "Vertically split" treatment group. The primary cause of their death appears to have been starvation. However, these "Horizontally split" and "Vertically split" colonies still contained frames with honey. In the "Horizontally split" colonies, the honey was in the outside frames and in the "Vertically split" colonies, the honey containing frames were in the outside frames in the bottom five-frame hive body. It would appear that this honey was not accessible to the colonies during prolonged cold periods during Winter and as a consequently these colonies starved.

Nosema may also have been a contributing factor in the death of the two "Horizontally split" colonies. They had a considerable quantity of fecal deposits around each hive's entrance, which would have been consistent with a significant *Nosema* infection. In addition, small colony size in late October may have been a contributing factor in the death of 1 of the "Vertically split" colonies.

The queenless colonies were

represented by one colony from the: "Vertically split", "Truncated colony", and "Quasi package" treatment groups. The queen's age or colony size in October may have been a contributing factor in the death of the colony from the "Truncated colony" group. This colony's queen had been in its colony for two or more years and had stopped laying eggs in early September, which would have also affected the number of bees in this colony during Winter.

The queen's age in the other two colonies was not likely a contributing factor since they were reared during July of the 2013. Despite this, one colony from the "Vertically split" and one colony from the "Quasi package" treatment group had much reduced brood production in September and October 2013, which could have contributed to a significant population reduction in these colony's during Winter.

The remaining 39 colonies initially appeared to have survived the Winter in satisfactory condition. However, additional colony loss occurred before the end of April.

On 20 April, colonies were reinspected. Almost all colonies had responded to the pollen supplement and sugar syrup supplied to them twelve days earlier by rearing brood. Colonies that remained broodless were also queenless. One "Truncated colony" and one "Quasi package" colony had become queenless. By 2 May 2014, three additional colonies had become queenless; one "Standard" treatment colony, one "Truncated colony" and one "Quasi package" colony.

The initial Spring colony and queen death were most likely attributable to a combination of: 1) colonies that were headed by old queens that were more than a year old or 2) colonies that were not provided with enough properly positioned food. Apparently, these colonies died because they were unable to access all the honey their hives contained. The latter problem might have been rectified had the colonies been fed 2:1 sugar to water syrup rather than 1:1 sugar to water syrup to ensure that they are able to store enough stored food for winter or the colony's existing honey filled frames been rearranged differently prior to Winter.

The reason that seven additional colonies subsequently became queenless was not as obvious. These queens may have died because of their age (Genersch, 2010), disease or they may have died because the colonies were being examined under less than ideal environmental conditions.

Winter food consumption: Figure 4 illustrates colony food consumption between 25 October 2013 and 2 May 2014. It was as expected. The "average" colony that was split in half in late August and wintered in single standard Langstroth hive bodies consumed less food **per colony** than did the average colony that had not been divided in half and wintered in two standard Langstroth hive bodies.

Even larger differences in treatment related food consumption could have been documented had these calculations included the 63 days immediately following colony treatment implementation when there were very large differences in colony populations between treatments.

This honey consumption data can be made more meaningful by converting these weights to frames of honey equivalents. If a well-filled standard Langstroth hive body weighs 86 pounds (38 kilograms), it should contain approximately 61 pounds (27.7 kilograms) of honey and each standard well filled Langstroth honey frame should contains approximately 6.8 pound of honey. This would means that a "Standard" colony would have consumed about 7.3 to 10.8 frames of honey and most colonies formed by splitting colonies in half on the 23rd of August would have consumed about 3.9 to 7.6 frames of honey between the end of October and the beginning of May. However, it should be noted that one split colony consumed 9.2 honey frame equivalents.

These food consumption weights are the **minimum** amount of honey required by colonies wintered outside during this time period. To prevent colonies from dying from starvation during winter or early Spring, after consuming all their available stored honey, beekeepers need to provide colonies with more than the minimum amount of food before wrapping colonies for Winter and to be prepared in Spring to feed their colonies with sugar syrup at the first available opportunity.

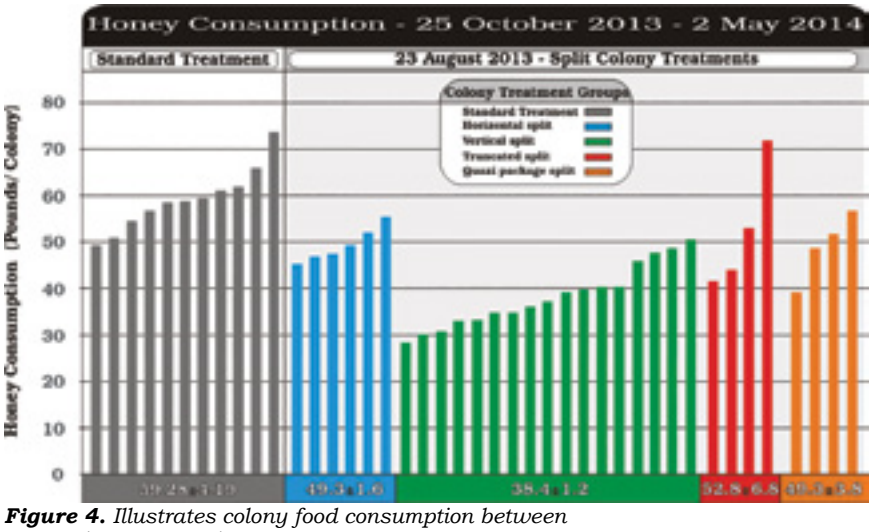

Figure 4. *Illustrates colony food consumption between 25 October 2013 and 2 May 2014.*

***Varroa* mites:** *Varroa* mites were detected in nurse bee samples collected on 4 September 2013 in all treatment groups. The colony infection rates varied from 0 to 6 percent. However, *Varroa* mites were not detected in any of the experimental colonies sampled on 14 May 2014 or 30 August 2014.

Nosema: On 4 September 2013, *Nosema* infections were relatively low ranging from 0 to 450,000 spores per bee. In Spring, on 14 May, 2014 *Nosema* infections persisted at detectable levels in the "Standard" treatment group and the "Horizontally" split treatment group.

Honey Production 2014: Honey production from the experimental colonies is illustrated in Figure 5. It was quite variable between and within each treatment group.

Evaluating these treatments depends on one's perspective and how one preforms the calculations.

If the treatments are evaluated in terms of average honey production per colony and the analysis does not include the colonies that died during Winter or went queenless in early Spring in the calculations, then the treatment rankings from highest to lowest would have been the "Truncated treatment" group (316.5 pounds) followed by the "Standard treatment" treatment group (276.0 pounds), the "Quasi package" group (235.2 pounds), the "Vertically split" colony group (214.9 pounds), and the "Horizontally split" colony group (170.1 pounds).

If one includes colonies that died during the Winter or went queenless in early Spring in the calculations, the rankings change and the "Standard colony" treatment group produced the most honey per colony (276.0 pounds); followed by the "Vertically split" treatment group (171.6 pounds), the "Truncated" treatment group (158.3 pounds), the "Quasi package" group (156.8 pounds) and the "Horizontally split" group (85.0 pounds).

If however, the goal was to produce the most pounds of saleable honey possible next year from a limited number of colonies, then doubling the number of colonies managed after the honey flow starts to look like an even more feasible management practice. If you rank these five treatments based on initial colony numbers after the honey flow and standardize the calculations based on 10 initial colonies per treatment group, the treatment ranking changes again.

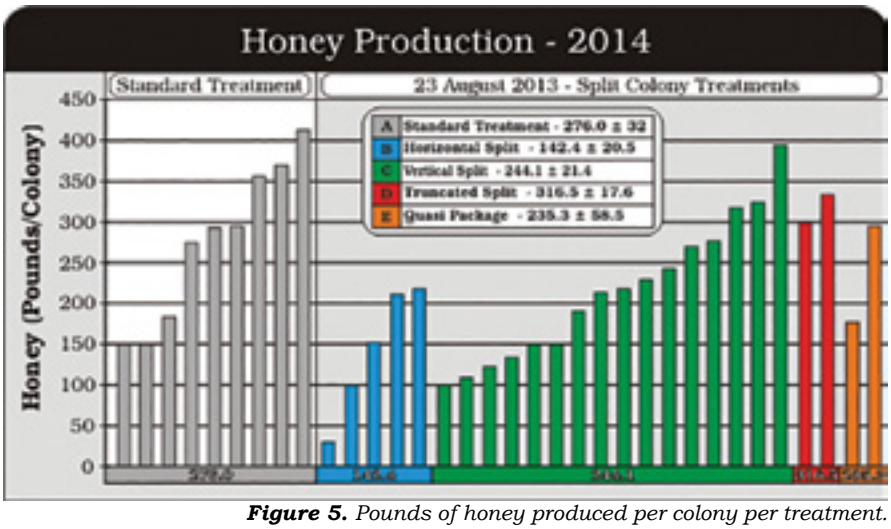

Figure 5. *Pounds of honey produced per colony per treatment.*

The "Vertically spilt" treatment group would have produced 3438 pounds of honey, the "Truncated" treatment group would have produced 3165.1 pounds of honey, the "Standard" treatment group would have produced 2559.5 pounds of honey, and the "Quasi package treatment" group would have produced 2351.8 pounds of honey per 10 colonies, and the Horizontally split" treatment group would have produced 1700.8 pounds of honey per 10 starting colonies per treatment.

Conclusions: Honey bee colonies contain thousands of bees at the end of the honey flow that are no longer required once the honey flow ceases. In late August or early September, once the honey flow has slowed to a trickle, these excess bees consumed colony resources without contributing significantly to the formation of the winter colony. Consequently, these excess bees should either be disposed of, or used to produce new colonies.

Splitting 18 colonies into mother colonies and daughter colonies on 23 August produced 36 colonies that contained enough bees that most colonies were able to be successfully over-winter outside during one of the coldest Saskatchewan Winters on record. Apparently, honey bee colonies can survive Winter reasonably well without having to have exceptionally large adult populations prior to Winter as long as they are provided with: 1) adequate amounts of useable honey, 2) pollen, and 3) insulative protection. Colony size during Winter appears to be correlated with a colony's total brood production after mid to late August rather than colony size near the end of the honey flow.

Colony Winter Survival: Colony survival did not seem to be affected by the size of the colony splits nor the timing of these splits. Winter colony losses in the spit colony treatments were 13.9 percent (5 of 36), which compared favourably with 18.9

percent Winter loss in Saskatchewan report by the Canadian Association of Professional Apiculturists for the Winter of 2013 - 2014.

The primary cause of colony death during Winter in the split colonies was attributed to: 1) cold starvation (inability to access stored honey in the hive), 2) acute *Nosema* infections and possibly 3) the age of the queens rather than colony size.

Food Consumption: Colony food consumption during Winter was much more than was anticipated. Colonies Winter out doors in two insulated standard Langstroth hive bodies had more than enough space to store enough honey to satisfy their needs during Winter and early Spring. Colonies confined to a single insulated Langstroth hive body will consume much of their available honey during Winter and by Spring will require additional food.

The problem of colonies dying from "cold starvation" could possibly have been prevented by placing all the honey stores in the top hive body and feeding 12 litres or more of 2:1 sugar syrup instead of 12 liters of a 1:1 sugar syrup.

Queen losses: Queen mortality/loss during April was the most significant cause of colony death. It was more significant than *Nosema* infections, or colony starvation from inadequate or improper placed honey stores. Because queen death has been linked with *Nosema* infections, it is not possible to exclude *Nosema* as the proximate cause of queen death and ultimately colony death.

The other possible underlying cause of queen loss and colony death was aging queens. Seven of the 11 colonies that died had queens that were more than a year old. Queen loss problem during Winter and early Spring might possibly have been minimized had all the colonies been requeened rather than just the daughter colonies (Genersch et al., 2010).

Dividing colonies in half to produce two colonies from one colony before Winter appears to be a practical and easy way for beekeepers to: 1) expand the number of colonies they manage, 2) produce new colonies for sale in the Spring, or 3) replace colonies that die during Winter and early Spring. Splitting colonies in half after the honey flow to form two colonies is a possible solution to deal with colony loss during Winter. BC

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Are You Listening?

NOTES FROM THE BOARD

Apis m. **mellifera**

Introduction

The history of beekeeping is filled with observations that have led to many efficiencies in the human manipulation of honey bee colonies. The welfare of their insect charges, however, has not often been a focus of beekeepers. This series of letters is being published here by we insects (*Apis mellifera),* therefore, addressing the beekeeping public, in an effort to increase the sensibilities of our human managers.

I, as recorder for the board of directors of the honey bee colony, have taken pen in hand to write concerning our thoughts about so-called modern bee culture. Collectively, we are concerned about the current status of the beekeeper-honey bee relationship and as such, would like to give a honey bee's-eye view of the situation.

You may be somewhat surprised to know a honey bee can write. I can't in human terms, but my letters are being faithfully copied by our beekeeper, a kind and gentle soul, who understands our language. He talks to us each day about worldly affairs, reads us the latest good as well as gibberish in the beekeeping publications, and generally keeps us informed of the human community's ideas about bee culture.

You may also wonder where much of our information comes from, emanating as it is from individuals who live relatively short lives. Honey bees, after all, have no books nor libraries to house information. With what audacity, therefore, do we insects suggest to counsel humans who're supplied with huge arsenals of scientific knowledge. Our collective knowledge is not in print, but lies in molecules, evolving over the years into wonderfully limitless configurations, providing more than the number of required permutations to store honey bee experience as it has developed over time. You humans must remember that our species is infinitely more ancient than yourselves, being in development perhaps tens of millions of years to your paltry two or so.

These preliminaries concluded, let me get to the first agenda item the board has asked me to address. We are much concerned about the smugness of some beekeepers today. They are constantly jawing in the journals about specific and simple answers to our problems. We are a complex society and pride ourselves as such. We suggest humans don't be misled by those who insist there's only one way or one time to do things. That is simply not the case in most instances. And woe betide we bees with a keeper who thinks so.

Often we are doomed to deal with exasperating circumstances put upon us by unthinking beekeepers that are hopelessly out of synchrony with our biology and that of the plants we depend upon. Sometimes these improperly-timed techniques result in the extinction of a colony, a loss to you and us alike. Most result from

the consequences of a quote in the movies some time ago: "What we have here is a failure to communicate."

We abhor this lack of communication, and through these letters hope to overcome the resulting barrier. Some of what we say will be controversial even among our own members. Much will perhaps be offensive to beekeepers, but it appears to be the only way we can tell our story as it is, rather than have it thoughtlessly and carelessly told for us.

It is fortunate that a couple of recent publications have cast aside the mantle we will be revealing in this series of communications. Dr. Mark Winston is the recipient of the 2015 Governor General's Literary Award for Nonfiction for his book *Bee Time: Lessons From the Hive*. One of the world's leading experts on bees and pollination, Dr. Winston is also an internationally recognized researcher, teacher and writer. He directed Simon Fraser University's Centre for Dialogue for 12 years, where he founded the Centre's Semester in Dialogue, a program that creates leadership development opportunities that equip and empower students to contribute to social change in communities.

The prologue to *Bee Time* reveals Dr. Winston's reply to a journalist asking whether bees and dialogue were connected or might have anything in common: "Absolutely," he responded: "Initiating a dialogue requires the same attention as entering an apiary. Both stimulate a state of deep listening, engage all the senses; hearing without judging.

"Through dialogue, time slows down, as it does in apiaries. Focus sharpens on how participants are interacting. Understandings emerge, issues clarify and become connected, and collaboration surfaces from the intentions and actions of many individuals. Solitary becomes communal.

"Dialogue has that apiary feeling, reading situations and discerning what there is to learn from each unique constellation of persons, circumstances, and issues. Those too-rare moments of presence and awareness, when human interactions are realized; they, too, are bee time." We couldn't agree more.

Dr. Thomas Dyer Seeley is the Horace White Professor in Biology in the Department of Neurobiology and Behavior at Cornell University. He is the author of several books on honey bee behavior, including *Honeybee Democracy* (2010) and *The Wisdom of the Hive* (1995). His most recent book we see as a masterful treatment of our biology and behavior, *The Lives of Bees: The Untold Story of the Honey Bee in the Wild.* We applaud Dr. Selley's efforts to "review what has been learned about how colonies of honey bees live in their natural world."

It is refreshing to have it be recounted how we free-living honey bees residing in tree cavities and rock crevices lead lives substantially different from those managed by beekeepers in white boxes jam-packed together into apiaries in apple orchards, blueberry fields or nestled in back yards. From insights developed through ingenious experiments, Dr. Seeley communicates to readers a fundamental truth. "Wild honey bee colonies are surviving and maintaining their numbers, while at the same time some 40 percent of beekeeper-managed colonies are dying each year."

On Controversy

There's been an alarming lack of controversy lately in the beekeeping journals. This makes for dull reading, and in the long run, little thinking. Some of our own board members even went to sleep while our beekeeper read one of the latest articles in a nationally-recognized publication.

One of the charms of the bee journals throughout history has been the differences of opinions expressed in their pages. True, this has led to some animosity, but we believe in the long run it has added to the average beekeeper's knowledge, and ultimately helped us bees. This recent lackadaisical state of affairs appears to be caused by a complacency developed over time by beekeepers because they've had it too good. Perhaps this attitude is justified. After all, why should a beekeeper have to do any work? He can sit back and rely on federal and state-subsidized research and education to do the investigating and thinking for him.

Note our use of the loaded word "him." We choose to use it here, knowing full well that most of us are in fact females, who are far more capable of running things in most cases than males in our society. This use is a compromise to increase readership and hopefully comprehension. Given that most human males seem to be wedded to their reputation as innate leaders and thinkers, they may well pay less attention to these letters when written by females, to their and our detriment.

The direct support noted above, along with financial resources, can in some instances bail humans out of the consequences of their beekeeping errors. This is not to our advantage since we bear the brunt of the errors often with no recourse to correct them. And in the end, the results, rather like Banquo's ghost, come back to haunt beekeepers and honey bees alike. There can be no substitute in our opinion for the average beekeeper to read as much as possible, mull over the information, talk to other beekeepers, and then act according to best-informed instincts to help us bees in times of crisis.

We are hardy creatures as noted by Dr. Selley in *The Lives of Bees.* As one of us stated in a recent communication: "We'd have to be tough to weather the storms foisted on us for decades by unthinking and uninformed beekeepers." We can and do endure many beekeeper mistakes, but this is taken in stride with the hope that each leads to a learning experience trusting that humans will begin to get a perspective on our complex lives. However, this only happens through much effort and study. Differences of opinion, based on independent investigation, and thought, should be cultivated, so each beekeeper can find their own way to effectively think more like a honey bee.

In conclusion, the recent lack of robust controversy in the bee journals is an ominous sign that beekeepers may be becoming lazy and or are simply not thinking for themselves. We are hurt by this malaise, more so perhaps than having our honey stolen, in the belief that beekeeping is somehow a "free lunch." We urge, therefore, a return to constructive controversy by beekeepers. Only by discussing and thinking out beekeeping problems based on a diversified information base, will both bees and beekeepers have much hope of prospering in the future. BC

And The Winner Is –

A Honey Show Can Be An Exciting Event!

Jennifer **Homes**[1], Karla **Eisen**[2]

Honey Shows are exciting events, and have historically been part of beekeeping conferences, State and local fairs. In some places they are standalone events that boast a few hundred classes and over 1500 entries, such as The National Honey Show which occurs each Fall in the United Kingdom. Outside of beekeeping related events, honey and other products from the hive find their way into other competitions such as the Good Food Foundation's annual Good Food Awards. In Florida, the University of Florida Institute of Food and Agricultural Sciences, Honey Bee Research and Extension Laboratory (UF/IFAS HBREL) that recently had the ribbon cutting ceremony on their new facility in October, 2018 hosts two annual events, Bee College and South Florida Bee College (SFBC). Aside from the educational program at Bee College, UF/IFAS HBREL offers a Master Beekeeper certification program, Welsh Honey Judge Training, and hosts a Honey Show at each event.

Jennifer Holmes was introduced to honey judging, and honey shows at a Florida Bee College one year. It happened when popping out of a stairwell, Michael Young, MBE, Institute of Northern Ireland Beekeepers Association and Senior Welsh Honey Judge met her and another with a smile and asked them to join in the fun; little did she know there would be mead and cake involved. Michael introduced an American-based Welsh Honey Judge training program here in the United States, and UF/IFAS HBREL is one of only a few places you can enroll in the training and become a Certified Honey Judge. The South Florida Bee College 2019 was held at the UF/ IFAS building in Davie, Florida in March and yes, there was mead and there was cake, and there was candy too! More importantly, there were two days packed with training and a really enjoyable and educational honey show. Attendees came from Virginia, Georgia, Alabama, and New York, as well as from throughout the State of Florida. In attendance were new program candidates, stewards advancing in the program from Florida and beyond, and judges from afar taking the advanced training, such as George H. Wilson, who has served as the Honey Show Chair for the Eastern Apiculture Society's Honey Show the past several years, and Arthur "Brutz" English, an University of Georgia, Young Harris College Beekeeping Institute Senior Welsh Honey Judge.

Michael Young MBE travelled from Northern Ireland to lead the two days of intensive training and judge the honey show. In fact ten individuals who worked either as judges or stewards plus two honey show entrants from the EAS 2018 honey show had a honey of a reunion at the training.

Judging mead.

Our whole class.

Michael Young

Michael started off the training by sharing the values that are the backbone of the high standards set forth in this training. He explained how striving to meet these standards enable the beekeeper to present the same quality honey and hive products to the consumer as they do to prepare products for the honey show bench. Michael shared many good reasons beekeepers can be proud of their craft and indeed also earn "bragging rights" when winning an award especially from this type of honey show.

A fine example he presented were the details involved in judging a pair of tapered candles. Michael brought five beeswax candles he made at his home and participants were amazed at the fragrance of them. We spent hours enjoying the candles and observed them in great detail, especially the way the candles burned. Participants learned how to assess the best quality candle and the one that gives the consumer the best value (hint: wicks have a lot to do with it).

Training participants were also treated to a taste of single source blackberry honey and to Ling Heather, a special Honey with unique characteristics in color, aroma, and jelly like consistency which is due to its thixotrophic properties.

Getting a honey cake right is some work and anyone who's tried it knows! Judging honey cake is a treat- pun intended! The training finished off with a toast, "Wassail" (a traditional gesture with mead), drinking a 10-year-old mead made by Michael with apricots – truly this was the icing on the cake after such a wonderful event. After reading about this training, if you are thinking like we are,

perhaps we will see you at the next honey judge training at University of Florida Bee College this Fall 2019.

However, we share some history on the honey judge training program. There are few training programs for honey judges in the United States, and those that exist consist primarily of shadowing an experienced honey show judge. In 2001, the University of Georgia in connection with the Young Harris College Beekeeping Institute started the American-based Welsh Honey Judge certification program built on British methods and judging criteria. In 2008, this program was adopted by the University of Florida Bee College and the program is currently being tested as an independent program in Alabama. The name can be quite confusing, so following is an attempt to clarify a few things based on the wisdom of Senior Welsh honey judge, A. "Brutz" English who refers to "*some strange truths*" in an attempt to corral the "*rumor round up*". First, the American-based Welsh Honey Judge certification is not a program used in Wales, and there is not a separate honey judge program specifically for Wales. Second, the American-based Welsh Honey Judge certification program is not affiliated with the Welsh beekeepers nor with any honey judge program in the United Kingdom (note the British Beekeepers Association have their own very rigorous requirements to become a honey judge); and third, the American-based Welsh honey judge certification program came here via Northern Ireland.

The two judging systems have much consistency in judging criteria and what to look for when judging various classes in a honey show although some of the assessment and scoring methods differ. Some refer to the different methods in terms of a qualitative vs. a quantitative approach or sensory vs. analytic. There are several unique items found in a Welsh honey judges' kit that judges in the American system do not usually use such as a long piece of string and a spring scale. Finally, yes, American-based Welsh Honey Judges are required to wear a white coat and hat during judging; the same uniform as worn by food inspectors and honey judges in the U.K.

We would love to hear from anyone who can share anything about how honey judges are trained in their area and don't forget to show off excellence in the craft and enter a honey show! BC

Southwestern Winter Blooming Bee Plants

Connie **Krochmal**

Some areas of the Southwest experience mild Winters. As a result, a number of bee plants can be blooming during this season.

Citrus is a major source of honey not only in the Southwest but also in the Southeast, West, and Hawaii. This crop is most common in Texas, Florida, California, and Arizona. A small amount is also grown in Georgia. The plants are generally suited to zones eight through ten.

While citrus can produce blossoms four or more times a year, the main blooming period is from late Winter into mid-Spring, usually from February to May.

All types of citrus are excellent sources of pollen and nectar. Generally, most of the citrus honey is labeled orange blossom although it is likely a mixture from various kinds of citrus.

Oranges, which are the most valuable citrus species for bees, yields surplus honey. The trees are a major honey source in California and Florida. This crop is also grown in Arizona and Texas.

The bloom time varies slightly according to the variety being grown with some blossoms appearing as early as February 6th in California and a couple weeks later in Florida.

The amount of honey can vary by location. In California, it averages about 60 to 120 pounds per colony, while in Florida it can be 75 pounds. Four out of five years, there is a good orange honey surplus in California.

Orange blossom honey is considered one of the nation's finest honeys. It can differ widely by flavor and color. The latter ranges from almost water white to bright light brown or light yellow.

The heavy bodied honey can granulate in a few months. The pleasing, fruity, mild flavor matches that of the fragrance of the blossoms.

Grapefruit is grown in Florida, California, Texas, and Arizona. This is a particularly valuable bee plant.

Lemons are cultivated in Texas, Arizona, and California. In California, these trees provide around 45 to 50 pounds of honey per colony. Lemon honey is quite aromatic and varies from clear or water white to light amber or yellow. The flavor ranges from tangy to mild with some slight tartness resembling that of the fruit.

Limes are grown mostly in California. These bear blossoms all year long, and produce lots of nectar.

Meyer lemon is a variety of lemon. Although it can bear blossoms any time of the year, the main blooming period is during the Winter. This variety is popular among home gardeners.

Black willow (*Salix nigra)* catkins begin appearing in February. All willows are sources of nectar, pollen, and honeydew. The thin bodied, mild flavored honey, which granulates to a fine texture, can vary in color from white to yellow. It can yield 90 pounds of honey per colony.

Various kinds of **fruit plants** start flowering in the Southwest mostly in February. These include plums, a source of nectar, pollen, honey, and honeydew. Dewberries also bear flowers at this time. They provide nectar and pollen with 50 to 150 pounds of honey per colony. This is almost water white and mild tasting.

Fragrant tea olive (*Osmanthus fragrans)* can bear scented blossoms sporadically throughout the year in warm areas. All of the osmanthus bring nectar and pollen.

In the Southwest, **dandelion** (*Taraxacum spp.)* can bloom as early as February in some areas. An excellent bee plant, it produces large quantities of golden yellow to yellow pollen. Both the nectar and pollen help to build up colonies.

Typically, the honey surplus is around 30 to 40 pounds per colony. But, sometimes there can be a huge honey crop of 700 pounds or more per acre. The thick, sharp tasting honey mellows with age.

Black Willow Catkins

Winter Blooming Camellia

Grape Holly

Sometimes cloudy, it ranges from various shades of amber to yellow. Crystallizing quickly, this develops fine to coarse, hard grains.

Unlike most other aloes, **tree aloe** (*Aloe arborescens)* bears blossoms on long spikes in Winter. Yielding pollen and nectar, the flowers can be yellow, orange, or red. The very sweet, mild flavored honey with a creamy body granulates quickly. The color varies from almost clear to water white.

Winter blooming camellia (*Camellia japonica)* bears blossoms from October to May. Two other types of camellias can bloom during the Winter in the Southwest. Net-veined camellia (*Camellia reticulata)* features red to pink blossoms from late Winter into early Spring. It is hardy to zone nine.

Sasanqua (*Camellia sasanqua)* begins flowering in Fall and continues throughout early Winter. Hardy to zone eight, the plant bears red, pink, or white blossoms. This species is especially popular in the South. Bees love all types of camellia blossoms. The flowers bring pollen and nectar.

Grape holly (*Mahonia aquifolium)* can bloom from Winter to early Spring. I've seen the sweetly scented, bright yellow flowers withstand frigid temperatures, snow, and ice when planted in a protected spot. The pollen is valuable for brood rearing. Hardy to zone five, this is a good honey plant.

Strawberry tree (*Arbutus unedo)* blossoms emerge from Autumn through the Winter. These are eagerly sought by bees. The plant can bring a honey surplus. This spicy, sharp flavored honey with a distinctive chestnut color has a hint of menthol or pepper.

Strawberry tree

One particular cultivar of **manzanita** (*Arctostaphylos x Emerald Carpet)* produces lovely pastel pink blossoms during mid-Winter. Hardy to zone eight, this low growing evergreen ground cover is only 1¼ feet in height.

Manzanitas are major bee plants in the Southwest, West, and mountain states. Bees love these flowers, which help to build up colonies. The plants can provide two full supers of honey, but 40 pounds is about average.

The wonderful tasting, heavy bodied honey smells like the blossoms. This is light amber to white.

Loquat (*Eriobotrya japonica)* blossoms can emerge in Winter in the Southwest. Tending to bloom heavily in alternate years, it is hardy to zone seven. The small evergreen tree is only 25 feet or so in height.

Loquat blossoms provide nectar and pollen. There can be a honey surplus of 50 pounds per colony. The profound amber honey is popular.

While the species discussed above have appeared in previous articles, the following are new.

Agarita (*Berberis trioliata)*

Found in Texas and Arizona, this native species is also known as wild currant and currant-of-Texas. Suitable for zones eight and higher, it grows to seven thousand feet elevation along slopes – particularly stony ones – waste places, hills, roadsides, open woodlands, fence rows, and limestone flats.

Agarita adapts to different soil types and pH levels, even alkaline ones. Withstanding heat and drought, this low maintenance plant thrives in sun and partial shade.

A rounded, upright evergreen with spiky, stiff branches, agarita grows to six feet in height with a matching spread. The rigid, greenish-gray, toothed, leathery foliage, borne on two-inch-long petioles, features three stalkless leaflets.

Agarita blooms over a long period mostly in January and February, depending on location. The small, yellow blossoms open in axillary clusters along the lengths of the stems.

Slightly tart, the red to blue-black berries ripen in the Fall. They're eaten raw and cooked.

Agarita provides a good quality, light amber honey. Sometimes, bees collect the fruit juice, which causes pink spots on the honey comb.

Related Species

California barberry (*Berberis pinnata)* is also called coast barberry. This native is suited to zones seven and higher. It grows in California and Oregon in thickets, woodlands, shrub land, coniferous forests, rocky slopes, and exposed rocky woods. The plant thrives in full sun and light shade.

Forming clumps, this suckering shrub is six to eight feet tall with a matching width. The mid-green leaves have purplish-green undersides. Four to six inches long, these are slightly shiny and spiny toothed.

Composed of seven to 13 leaflets, the foliage is much more finely toothed than that of most barberries. Featuring closely spaced spines along the margins, the leaves are mostly ovate.

California barberry blossoms emerge from late Winter into Spring, typically February to May, according to location. The soft yellow flowers form axillary racemes, three inches long. This species yields a good quality amber honey. The blue-black to blackish-purple fruits are ovoid to globular.

Harrison's barberry (*Berberis harrisoniana)* is also known as red barbery, kofa barberry, and Kofa Mountain barberry. It is native to Arizona, particularly in the Ajo and Kofa Mountains. The plant occurs mainly on rocky canyons mostly to three thousand feet elevation.

The drought tolerant, rounded shrub reaches three feet in height with a matching spread. The compound leaves consist of three-parted leaflets with three spines.

The scented, vivid yellow blossoms contain six petals and nine sepals. These appear from January through March on dense clusters with ten or more flowers. The juicy, blackish-blue berries ripen from late March onwards, depending on location.

Growing Native Barberries

Relatively free of disease and pest problems, the deer-proof, drought tolerant plants adapt to many soil types, even poor ones. Depending on the species, these thrive in full sun to heavy shade.

Barberries are suited to most average soils. They're undemanding, easy to grow species. These are propagated by seeds, cuttings, and in some cases division.

Birds, who love the berries, distribute the seeds to new locations. In addition, some species can spread by suckers and stems that can produce roots wherever they touch the ground. Both methods allow introduced barberries to naturalize.

USDA and Canada have restricted the transport and cultivation of certain kinds of barberries across state lines in wheat or grain producing states because some of these species serve as hosts of black stem rust, a serious disease of small grains.

Mistletoes (*Phoradendron spp.)*

Several species of mistletoes occur in the Southwest. **Colorado desert mistletoe** (*Phoradendron macrophyllum ssp. macrophyllum)* is native to California, Arizona, and New Mexico. **Pacific mistletoe** (*Phoradendron villosum)* can be found in California and Oregon.

Christmas mistletoe (*Phoradendron tomentosum)* is native to Texas, Oklahoma, Louisiana, and Mississippi.

The most widespread species is **oak mistletoe** (*Phoradendron leucarpum).* Also called American

California Barberry

mistletoe, it is native to most of the East westward to Kansas, Arkansas, Oklahoma, Missouri, New Mexico, and Texas.

Oak mistletoe resembles a roundish green mass on tree trunks and branches. About one to three feet wide, the semi-parasitic plant is most visible after the tree sheds its leaves. This features forked twigs. The small, thick, oval to obovate, evergreen foliage is greenish-yellow.

The small, globular, pulpy berries or drupes mature and ripen about a year after flowering occurs. The fruits range from white to amber white or cream. Birds love these berries, and that is especially true of bluebirds and cedar waxwings.

Covered with a sticky, toxic substance, the fruits contain one to three seeds, which are distributed by the birds to new trees. The fruit coating adheres the seeds to a tree branch or trunk until they can germinate.

The small, greenish blossoms, one-eighth of an inch wide, appear on short, jointed, axillary flower clusters. The blooms emerge at intervals along the flower stalks.

Containing no petals, these feature a green calyx with three to five lobes. The corolla is absent. This has the same number of stamens as the number of calyx lobes. The pistil is solitary.

These flowers release an orange-like aroma. The nectary is found at the base of the calyx. The male and female blossoms are on separate plants, but both kinds produce nectar. However, the females are a richer nectar source.

In Texas, this is typically the first bee plant of the year to bloom with the flowers opening in December and January. Frank C. Pellett, author of 'American Honey Plants,' wrote about seeing the bees work the flowers in January and February in Texas. Elsewhere, the plant can bloom sporadically throughout the winter into March, depending on location.

The pollen from all types of mistletoe blossoms is especially valuable for brood rearing. The various mistletoes can yield a small honey crop, usually about 15 pounds per colony.

Oak mistletoe is an important honey plant in the South. The very sweet honey is light colored with a thick, sticky body. It can be hard to extract. BC

Connie Krochmal keeps bees and writes about plants from her home in Kentucky.

The Bees And Me On A Summer Afternoon

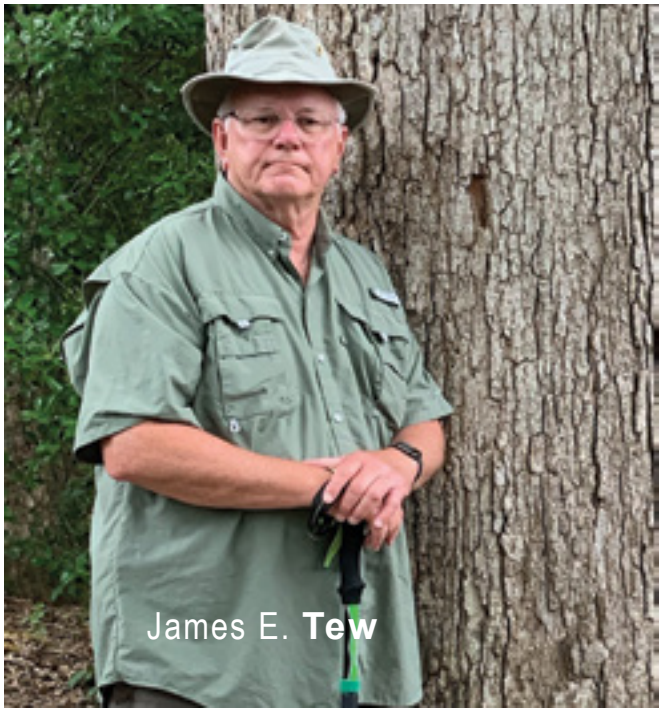
Hive entrance clues to a complex life

Yet, another odd *Bee Culture* article brought to you by Jim Tew

I always thought that I would enjoy doing this. Here I am, sitting in my beeyard, keying on my iPad with a roaring beehive seven feet in front of me. For now, the bees are ignoring me, so I am writing for you on their behalf.

Today is July 14, 2019. Blue skies and upper 70s. It is a good day for the bees and me. From where I sit, I see (*even at this short distance, I am using binoculars*) several groups of bees at the entrance that can be distinguished.

1. Typical propolizers. These bees methodically go about their drudge work, packing, chewing, rocking while constantly applying the propolis on a selected needy entrance location. The behavior looks routine, yet I have no idea why a particular spot was chosen or how propolizers can tell when the task is finished. After many, many hive observations, I would conjecture that propolizing a hive or cavity is never truly finished.



The four-deep colony I quietly observed. This was a swarm six weeks ago.

There is so much I don't understand about this procedure. Where do these hardworking bees get their supply of propolis? I have seen pollen sacs[1] loaded with raw gum/resin that the bees are bringing back, but – apparently – that gum/resin must be mixed with some wax and blended with saliva to make the propolis product. This is done inside the hive – in the dark – where I can't see.

So, is there a propolis brigade within the colony? I can't see loads of propolis product coming from within the hive to the work site, but I readily admit that I have not closely looked for such a behavior. Might I conjecture that the bees that are mixing the components, bringing a mouth-load to the needy site where they or other propolis-working bees spread it and shape it. That is my guess.

About this "*mouth-load*" of fabricated propolis. Does propolis and/or the gum/resin it is made from, have any food value or more likely, health value. As it were, is propolis something like an antibiotic that bees take for maintaining healthy systems? After all, the plants secreting the resins[2] are frequently producing the material to help heal a wound.

When we install packages or swarms onto new equipment and foundation, is resin collection (or gum collection) also high on the collection list of items that foragers need from nature's "*store*?" Please remember that propolis bits, like chocolate chips in chocolate chip cookies are blended into new comb from the very outset of comb production.

[1]Others have a more academic understanding of propolis, and it's uses. But I would like to suggest that "pollen baskets" as a description term needs to be reconsidered. Hive foragers bring back a huge amount of resins and gums to fabricate into propolis. I wonder how many gum loads colony foragers bring back when compared to pollen loads. Should we rename pollen baskets something like "cargo baskets?"

[2]Gums and resins are not the same thing. Gums are water soluble but otherwise produced by plants. Resins are not water soluble and are also produced by plants. I know nothing about the ratio of these two possible components, but this leads me to ask, "Are there different types of propolis based on gum/resin ratios. Are some types of propolis more useful than other formulations? Do foragers preferentially search for one or the other?"

A routine propolis worker, but far more complex than it appears.

A pollen forager using her "Cargo Basket."

2. The pollen collectors. I like to watch pollen collectors because they are so easy to see. After all, they come back to the hive with individually colored markers. Not much of a mystery what they have been up to. At different times of the year, I see much more pollen collecting – or is that obvious behavior simply due to the immediate demand for protein within the colony? I'm guessing both.

The bees that I am watching today are experienced foragers. No young bees in front of the hive marking the territory and learning "*to drive*" as it were. These bees leave at full power and return with same high velocity.[3] Returning bees routinely crash and bump into each other. Since there are so many of them and they are so close the each other, I doubt that they take time to say, "*Oh, excuse me for knocking you for two flips.*"

This experienced flight activity reflects a frantic attitude for leaving the hive and then returning to the hive. These are not orientation flights. Winter is coming. Now is the time to garner whatever is out there. Here is a huge ironic consideration. The individual forager doing all the foraging and collecting will never get but the smallest tad of that pollen back – if that much. They're foraging for the brood nest – not for themselves.

When foragers leave on a sortie, I have no idea where they are going. I can only vaguely imagine how they originally found the foraging site. Then with maybe 1/6 drop of nectar, they fly home. I know what the books say. Dancing, exploratory foraging, color vision, olfactory senses, sunlight coordinates and – boom – the bees are at the collection site. As much as I can, I understand that, but really? As I watch an animal that is about 5/8" long (the width of my thumbnail), take off on this trip, using all those sophisticated tools I listed above, I suggest that we have become hardened to unique success of even a single successful foraging trip. Yet they make thousands of these trips per day. It is a dangerous job. For a great number of reasons, many do not conclude in a successful trip.

3. Foragers in general. Right now, right here, at this time on this day, I estimate that nearly all of the returning bees show no signs of their success or failure in their activity just passed. They could be returning successful foragers ladened with nectar or water or nothing. Maybe they totally failed. Years ago, beekeepers would dramatically say that the nectar flow was so great that returning foragers would, due to their heavy weight, literally plop on the landing board. That sounds a bit dramatic to me. There is not a heavy nectar flow underway just now. Maybe that matters, but I cannot determine that any "*plopping*" is ongoing. The bees are simply returning with their classic erratic OMG landings at the hive entrance.

We know that foragers will become scout bees at specific times of the year and spend time looking for a new nest cavity. This colony was a swarm just six weeks ago. But I wonder, as I watch this colony, if it will still have foraging scouts searching for new cavity locations even when swarming is not eminent or even concluded?

Well that's stupid – right? Probably, but wait. If possible, bees have multiple sites for food collection and multiple sites for water and gum/resin collection. That makes sense, but would scout bees wait until swarming is upon them before beginning the cavity searching behavior? That late behavior makes the new cavity search for a location a timed and desperate undertaking. They must quickly find a suitable place or live outside and die.

If we generally accept the notion that bees are instinctually unhappy (or untrusting) of their home site and could possibly be forced to abscond at a moment's notice[4], would it not be advantageous to the colony to have an idea where to go if needed. Maybe that's why bees formed the bivouac swarm site. It would give them a few days to search for a new site. Even so, I would think that

[3]An observation of mine – departing bees literally depart in a bullet "bee-line" but return to the hive entrance like small aircraft flown by punch-drunk pilots. If an aircraft landed like the typical bee lands at the hive entrance, we would never board an airplane again. It's a rough ride down close to the deck.

[4]Maybe the tree falls that houses their nest, or maybe a fire comes through and burns the beeyard, maybe water rises. Nest sites are not permanent, and resident bees may have to quickly depart. I would suggest, without documentation, that every bee instinctually knows this. Do they have contingency plans or not?

it would be a good idea to have a general idea of where they could go. That makes sense to me, but ironically, I have never been a bee.

So, I am circuitously back to where I started. If all these foragers that are roaring out and roaring back home, were loaded with nectar, pollen or water, the hive would need extra supers on a more frequently schedule. I would bet that many of these bees are coming back with nothing more than surrounding environmental experience and related information that could be beneficial to their continued existence at this hive location and at this time. I am 100% guessing.

An aside . . . I had to knock off yesterday evening. Other things to do and I needed a break. I'm back here now. However, I do like sitting out here in my junky apiary watching the bees. I say "*the*" bees because I have come to realize that they are not truly mine. We're just a couple of species passing the time – coexisting.

However, in NE Ohio, it is manure spreading time of the year. What a difference a day makes. Yesterday, I could get whiffs of the bees' hive and colony odor. Today, I get an overpowering odor of composting manure. And the gnats and biting flies – I did not factor them in. Apparently, they too, like visiting me and my beeyard.

But there are birds and chipmunks everywhere. The breeze is gentle, and the Ohio sky is beautiful blue – a rare event for this part of our country. The bees make a steady buzz. That helps make the manure smell tolerable.

Two, of many sounds that have remained the same all my seventy-one years are: (1) the sound of a single engine plane droning overhead and (2) the sound of a gently buzzing beehive. The plane sound is fine and reminiscent of times long ago, but there is also a commercial jet somewhere high overhead just now. The single engine sound has competition from newer sounds. Plus, the airplane engine sound has only been around for one hundred years or so.

But the bees have always sounded just this way. The sound coming from an active hive on a Summer day is a mental audiogram and is timeless. It's an audio memory. Flying bees always sounded this way. The smells, the sounds, the behaviors, the historical continuity – I am simply not enough of a writer to capture this zin-like beekeeping moment for you. I'm sorry. (No, I'm not crazy and yes, this has become too sappy. Moving on….)

4. Water collecting bees – the odd lot. Every time I walk to my apiary, I walk by my well-worn bird waterer that was given to me by my neighbor. She was frustrated that bees had taken over the device in her yard to such as extent that birds avoided it. She gave it to me to get the bees out of her yard. You know how that ended when she put in her new watering device. The bees happily welcomed the new device as an additional source of water.

Even in my small apiary and even here in moderate Summer temperature Ohio, my bees simply have to have multiple water sites – even many. During warm/hot weather, there are always five to 10 bees at my bird bath. I assume that the foragers are from the two colonies that I currently have here, but how could those foragers gather enough water to cool the large hive on hot Summer days? Ergo, are many of these

Oh come on now! I can see water foragers finding an obvious pond or even my bird waterer, but these foragers are truly good at what they do.

seemingly empty foragers by actually returning with water collected from different sites other than mine? I have spent a significant amount of time pondering water foragers. They deserve more attention and contemplation.

For me it would be easy to assume that these empty-looking bees are, in fact, an army of water foragers. The weather is hot and dry just now. I have provided no other entrances other than the front entrance. It could easily become hot inside the hive. I would guess that these apparently, unloaded returning foragers, are part of a significant water foraging cadre that is dispersed across the surrounding area to multiple water sources.

5. Bees doing nothing – but doing it very well. There are bees at the entrance that scurry here, scurry there – scurry everywhere, but never seem to really accomplish anything. Others have described this "*do nothing*" behavior as essential to the colony's survival.

Not all of those foragers above had a successful trip and some probably died of the trip. Immediately, another

Some bees working while some bees are standing around awaiting a stimulus.

recruit stands at the ready to step in and fill the job description. I'm okay with that notion as far as it goes. But who or what tells the unemployed bee that a job assignment has come up for them? I would guess that each bee makes its own decision. Essentially a particular bee "*volunteers*" instinctually to take on a given task.

I know that we have colony task charts that outline what bees do at various times of their short lives, but to most beekeepers it is common knowledge that bees can revert to previous stages in their life. I would not guess that it is anything like a true thought, when a bee "*realizes*" that it is part of a new nucleus hive and now once again needs to feed brood, possibly a stage she has already passed.

What stimulus causes this "*over the hill*" worker bee to revert (so much as physiologically possible) to a brood food producing stage? Could the answer be nothing more than open brood that is inadequately fed. Can such larvae put out a distress signal? I'm sorry, but again, I don't know.

It does appear that the bees that I can see at the hive entrance are doing nothing and all the bees inside the hive that I can't see that also are doing nothing, comprise a reserve force. The concept on which I am weak is how the unemployed bees are assigned or accept a new task. Obviously, there is no drill sergeant. There must be colony and hive stimuli that elicit a response from a bee that is currently unassigned to a colony task.

6. I have to stop this, but before I do, I must gloss some topics. I didn't mention the wash-boarding bees on the hive front. *(See my video on YouTube on the subject)* There were not many, but I still do not know what they are doing. Just dancing the time away.

7. The hive cleaners. Neither did I mention the house cleaning bees, that would at about 30-minute intervals, try to fly away with a dead comrade. I was surprised at how many could not take flight and crashed about three to four feet in front of the hive. But that was far enough to prevent a mass of dead bees accumulating at the hive front. I have this particular hive sitting on a Beemax hive stand so it is about eighteen inches high.

8. *Airconditioning bees.* Fanning bees cooling the hive by evaporating water provided by water foragers, were on the job all the while I watched. I couldn't discuss everything. The writer who first used the concept of the "*City of the Bees*" was spot-on.

I hope I have not wasted your time. I had a pleasant, relaxing time writing it. Next month, I plan to discuss some equipment I have been using and a couple of unique places I recently visited. Until then. BC

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

A video chat

https://youtu.be/PhPulcPkAzs

BEEKEEPER'S TOOLBOX

Jim **Berndt**

I am not a naturally tidy person; I am not one of those people who knows precisely where everything is and have my tools outlined on a pegboard in my shop. Having said that, I like to have the tools at hand when I am working on a project. Many beekeeping operations can be done with nothing more than a hive tool and a smoker but others require a variety of tools and supplies. I wanted some way to keep all of these things together and handy as I moved from hive to hive and apiary to apiary. I decided that a simple toolbox, dedicated to beekeeping, would be the best solution. That way when it's time to check my bees all I have to do is grab my toolbox and go (Figure 1).

I've seen other beekeepers use a variety containers to carry materials around the apiary – five-gallon buckets, modified nuc boxes, and a variety of other small containers. One of the problems I noticed with many of these repurposed containers is that most of the stuff sits in a big pile in the bottom, requiring the beekeeper to dig through the pile to find the thing they need. I wanted something a bit more organized – something that would hold the tools I use all of the time in dedicated slots but still have some open space to hold the miscellaneous things I need on any given day. I also wanted a way to keep track of some of the bits and pieces that are too small for a dedicated slot but could be hard to find in the bottom of the box – things like extra screws and nails, an extra lighter, or empty queen cages. And I wanted to be able to carry my lit smoker in or on my toolbox. This would allow me to carry all of my tools in one hand as I move from hive to hive and would leave the other hand free to carry other things.

So, what types of things do I need or want to carry when working my bees? Beekeepers love gadgets and it would be easy to overload a box with every conceivable device for every possible need. I designed my toolbox around the things I use frequently, leaving space to carry specialty items when they are needed. So what do I want to have available all of the time? I want to have a couple of hive tools and a smoker. I need fuel for my smoker and a lighter to get it started. I occasionally use a bee brush and a frame hanger, so I want those handy. I also need the tools to make simple repairs to my hives if I find a problem. If I come across an unmarked queen I want my queen marking pens and possibly an empty queen cage. I need to have my notebook, pens and markers to maintain my records and for making notes on frames as needed. I also need the space to carry the things related to what I am doing on that visit; wash bottles for mite counts, sugar for feeding, a couple of extra frames, or possibly packages of mite treatments. This toolbox works well for me, I can easily find all of these things without having to dig through a pail or sort through an unorganized box.

Like many projects, my "simple toolbox" became a little more elaborate by the time I incorporated all of the features I wanted; still, I have been pleased with the results. My beekeeping toolbox is a version of the classic tradesman's wooden toolbox – simple to build and easy to adapt to specific needs. On one end I keep most of my tools in dedicated slots. Since I keep both top-bar and Langstroth hives, I carry a traditional hive tool and a serrated knife (my top-bar hive tool). My hives and other beekeeping equipment are assembled with a variety of screws so I keep screwdrivers for each type handy (Figure 2). Along one of the side walls I have slots for my stapler and my beekeeping notebook. Next to those slots, I have a strip of wood drilled out to hold markers and pens (Figure 3). My bee brush fits in a slot on an outside wall, angled upward so that the brush doesn't fall out when moving the box (Figure 4). On the opposite long side I have cut slots to fit my frame hanger brackets so the brackets slide in

Figure 1. My beekeeping toolbox (now a couple of years old) with the tools and supplies I use most often.

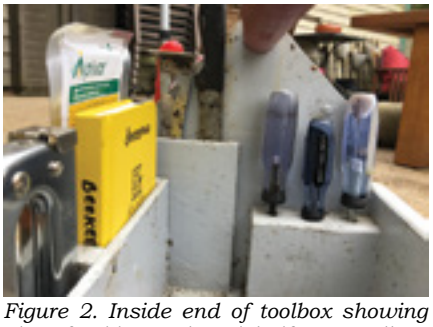


Figure 2. Inside end of toolbox showing slots for hive tool and knife as well as dedicated holes to keep various screwdrivers.

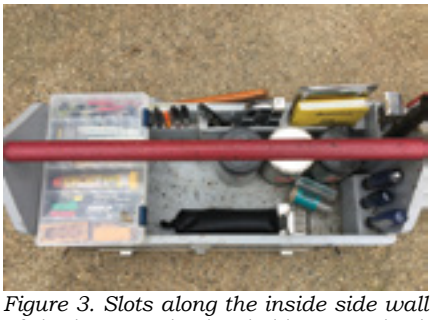


Figure 3. Slots along the inside side wall of the box are sized to hold my notebook and stapler; a block at the end of the slots is drilled to hold markers and pens.

Figure 4. The holder for the bee brush is sized to fit the brush handle and angled upward to keep the brush from falling out.

Figure 5. Slots cut through the tool box side allow the frame hanger to rest flat against the side of the box.

Figure 6. I attached feet at either end of the box to provide clearance for the flange of the frame hanger, which extends slightly below the bottom of the tool box.

along the box bottom and the rails are snug against the box side. A small toggle keeps the frame hanger in place (Figures 5 and 6). One end of the toolbox has a wooden bracket to hold my smoker and a wooden block drilled out to hold my lighter (Figure 7). A hole drilled through the end is sized to hold my smoker cork so it doesn't get lost when the smoker is in use.

The interior of the box is open and used to carry whatever I may be taking out to the beeyard on that day. I usually carry three coffee cans with tight fitting lids, one each filled with tinder and hardwood pellets for my smoker, and one filled with thin gloves to wear during inspections (Figure 8). My box is long enough to hold a standard Langstroth frame and deep enough that a deep frame can rest against the handle and not fall out.

My solution for organizing the small bits and pieces is a plastic tackle box. I have attached wooden rails to the bottom of the tackle box, which fit against the inside walls of the tool box, so the box can sit snugly on top of the toolbox (Figure 9). This keeps the tackle box easy to access and keeps it from taking up space in the interior of the toolbox. My tackle box usually contains things like extra screws, nails, an extra lighter, queen cages, queen paint markers, and other small items (Figure 10).

I used ¾" (nominal 1") pine lumber to build my box, which was what I had on hand. All of the joints are glued and screwed together for strength. The handle has one large bolt on each end for strength and a smaller screw on each end to keep the handle from rotating. The interior partitions are made from ¼" plywood.

The holder for the smoker on the end of the box was the only tricky part of the construction. The smoker is held by the bellows so the wooden bracket needs to be sized for the bellows of your smoker. I laid my smoker on its side and traced the profile of the bellows when it was fully expanded – I then transferred that profile to my lumber to make the sides of the bracket to hold the smoker. I drilled a hole in the plate on the front of the smoker bracket that matches up with the hole in the bellows which blows air into the smoker. This allows me to pump the smoker occasionally to keep it burning while leaving it in its holder on the toolbox (Figure 11).

If I were to build another toolbox I would consider doing a few things differently. First, I would probably build it out of some thinner lumber. The ¾" pine of my box is very strong – probably much stronger (and heavier) than needed. Using thinner stock would cut down on the weight of the empty box. Second, I would probably make it a bit shorter as the current length is a bit awkward to maneuver sometimes. I think the ideal length might be such that a standard frame could just fit in the interior space (about 3-4" shorter than my box is now). I might make the sides of the box an inch or two deeper to give a little bit more storage space.

The drawing shows the dimensions of my toolbox. I provided these dimensions for reference only as one of the great advantages of this design is that it is adaptable to the size the user needs. Give some thought to what you want to carry and size your box accordingly. I used simple butt joints for my toolbox, but if you want to make a stronger (or more impressive) joint you could use a box joint or dovetails. In the same way, I used inexpensive pine lumber and painted the finished box, you could use some nice hardwood and stain your box if you prefer something a bit showier. BC

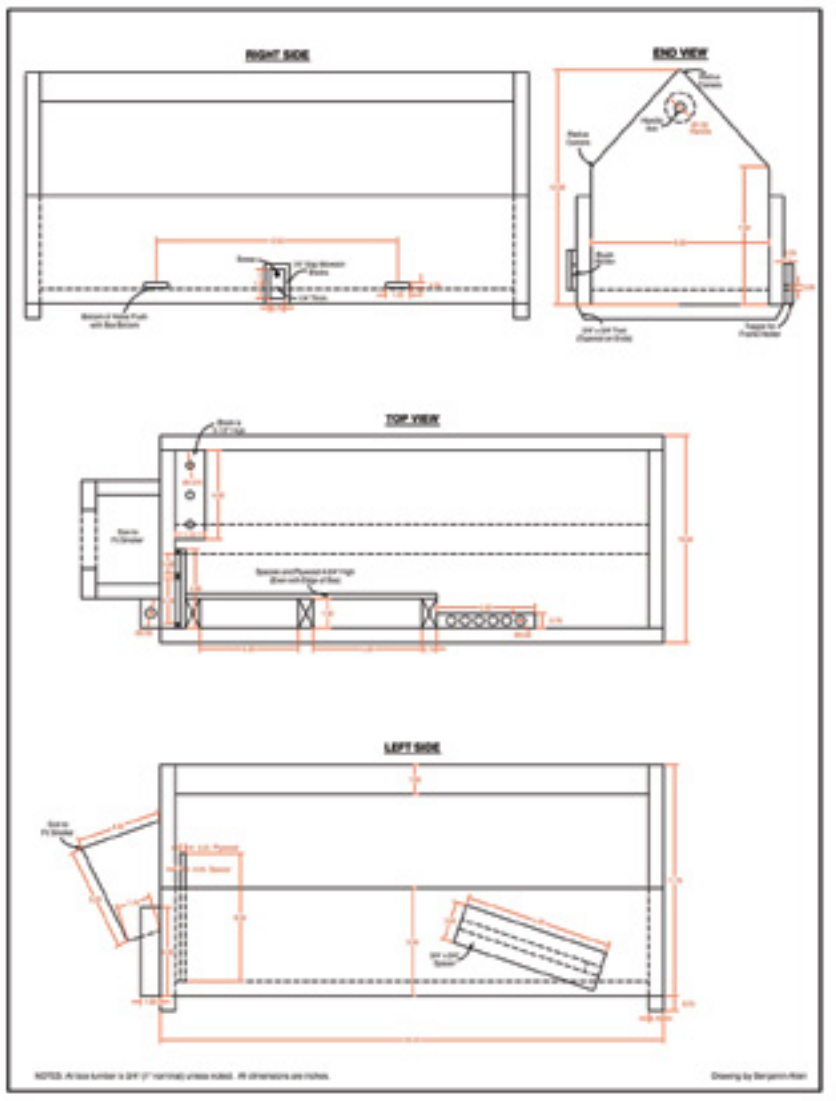
Figure 7. Wooden bracket at the end of the box holds my smoker and a block with an appropriately-sized hole holds my lighter.

Figure 8. Sealed cans in my toolbox keep smoker tinder and fuel dry while another can keeps thin exam gloves clean and ready to use.

Figure 9. Wooden rails attached to the bottom of the tackle box (screwed from the inside of the box) are spaced so that they fit snugly inside of the sides of the tool box.

Figure 10. Inside of my tackle box that sits on top of my tool box. These little bits and pieces would otherwise become lost in the bottom of my toolbox.

Figure 11. Smoker bracket with smoker. Note that the side gusset of the bracket is the same size as the side of the smoker bellows. Also note the hole drilled in the face of the bracket (red arrow) – this hole matches up to the air hole on the smoker and bellows and allows the smoker to be pumped while sitting in the bracket. The hole in the end of the toolbox (yellow arrow) holds the smoker cork when not in use.



FEEDERS

Every Feeder Has Its Strengths And Drawbacks

David **MacFawn**

Volume, Cost, Small Hive Beetle And Time All Add Up

Feeding your bees for their survival is critical if they are out of food. Sugar syrup feeders and pollen feeders are important for feeding. Each type of feeder has its place. In the southeast the pollen feeder has replaced pollen patties due to Small Hive Beetles (SHB) reproducing in pollen patties.

Sugar Syrup Feeders

Pail feeders are inexpensive (about $8 for a two gallon). However, they do require an inner cover. The pail feeder is inverted and the pail sides squeezed and released to create a vacuum so the feeder will not leak. Then the feeder is placed over the inner cover hole on the inner cover. Pail feeders are easy to fill, transport, and clean. Most beekeepers place a deep super around the pail feeder to prevent hive issues with weather, animals and robbing. Tiny holes punched in the lid or a screen allow the bees access to the syrup. If you punch, use a small hive nail. If you use a migratory cover without an inner cover as your standard configuration, you will need to use an additional inner cover to place the pail feeder on.

Frame feeders, also known as Division Board feeders, work well in warm weather. However, in cold weather the bees may not be able to access the sugar syrup. Frame feeders are easy to fill when the feeder is placed on the side of the brood chamber or super. The super above is merely slid over, the frame feeder filled, then the super slid back into place. A float, such as a twig or popsicle stick, or other material needs to be placed in the frame feeder to keep bees from drowning. Cleaning the frame feeder may be tricky since it needs to be removed from the hive.

Jar feeders work well in warm weather or cool weather in the southeast. In much of the southeast it rarely gets below about 25°F. Sugar syrup will typically not freeze in much of the southeast. Bees can access the syrup in warm or cool weather. When the bees move upward through the equipment stack in the Winter, and they exhaust their honey stores and reach the feeder, the bees can huddle under the feeder and access the sugar syrup. Jar feeders are inexpensive, the jars can be transported easily, and cleaned easily. It should be noted glass jars may break in the beeyard causing an issue. Thick plastic jars are recommended; thin plastic jars will collapse.

A 10-frame hive top feeder (also called Miller Feeders) with floats costs around $27. A two gallon pail feeder costs around $9, plus an inner cover which cost around $11 means the beekeeper has about $20 initial invested. Therefore, a hive top feeder configuration is about $7 more expensive than a two-gallon pail feed configuration. If you only have a few hives it may not matter. A hive top feeder is easier to refill than a pail feeder which results in less management time. With hive top feeders, the bees access the syrup via the opening between the reservoirs.

Mold in both will need periodic cleaning. Use of Honey Bee Healthy has been proven to reduce mold in all types of feeders. Hive top feeders will hold greater than two gallons, and a pail can hold about two gallons. The feeder

Pail Feeder Lid

Pail Feeder on inner cover.

Frame Feeder

size is important if the beekeeper has outyards. Larger feeders are preferred for outyards so you do not have to make as many trips.

Yard, or open, feeders should be at least approximately 200 feet away from the apiary to prevent robbing. A yard feeder may be as simple as a bucket with straw so the bees do not drown in the sugar syrup. However, the issues with yard feeders are:

- Weak colonies may not get their fair share of the sugar syrup
- They may spread diseases
- The bees cannot access the sugar syrup in cold weather when the bees do not fly (typically less than 48 to 50°F)

However, yard feeders have their place for time efficiency and reduced labor.

Boardman entrance feeders should only be used to dispense water. Period!! Feeding sugar syrup via a Boardman can allow robbing. Also, feeding sugar syrup via a Boardman in the Winter results in the bees not being able to access the syrup if the bees are clustered. Visible clustering occurs at 57°F. Boardman feeders are inexpensive, only around $5 plus the jar cost.

If you are a Top Bar Hive user, I refer you to Dr. Wyatt Mangum's Top-Bar Hive Book for feeding discussions.[1]

Pollen Feeders

In some locations there may be seasonal pollen dearth's. Pollen dearth's are especially critical in autumn when the winter bees are developing. Lack of pollen will reduce brood production even if you have plenty of nectar/honey. It takes pollen and honey to produce young bees. Hence, it may be viable and important to feed pollen substitute to stimulate brood production.

Several methods are available. The beekeeper can feed pollen patties or dry pollen in feeders. Pollen patties have lost favor in the southeast due to small hive beetles (SHB) reproducing in the pollen patties. Dry pollen in pollen feeders has replaced pollen patties as the method of choice in the southeast. A pollen feeder may be as simple as a pail turned 90 degrees on it's side and nailed on a tree (Figure 7) or a more elaborate pollen feeder (Figures 8 & 9).

Another way to feed dry pollen substitute is to place a small amount on top of an inner cover. However, you need to watch if the pollen substitute gets wet from the hive moisture and attracts SHB. Putting pollen substitute on top of an inner cover will help colony pollen shortage in cold weather when the bees cannot fly.

Pollen patties used to be placed immediately above the brood nest. A small quantity was used to minimize attracting SHB and an amount that the bees could consume in a couple days. However, each hive had to be opened which required a lot of time.

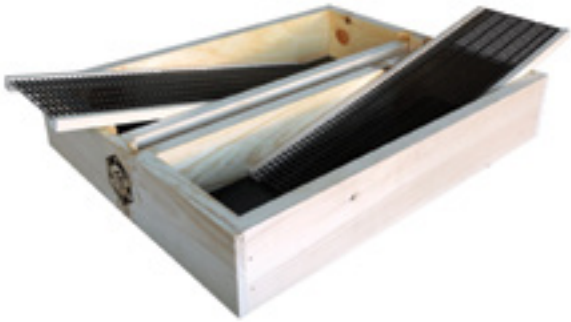
In Closing

Each type of feeder has its use, benefits, and disadvantages. The pail feeder is the most versatile for warm and cold weather. It is also an inexpensive way to feed syrup. Yard feeders are even less expensive but have some disadvantages. Pollen feeders are also important for continued brood production during pollen dearth's especially in autumn. Feeding dry pollen substitute in pollen feeders alleviates some of the Small Hive Beetle issue inside the hive. BC

[1]Mangum, Wyatt A. Top-Bar Hive Beekeeping: Wisdom & Pleasure Combined, ISBN 978-0-9851284-0-1.

Jar Feeder

Boardman Feeder



Hive Top Feeder

Pollen Feeder

Pollen Feeders

First Rule Of Beekeeping

Stephen **Bishop**

There is a subset of beekeepers to which "buy" is a profane word. Often these beekeepers are identified by ageless flannel shirts, tin-can smokers, and rickety bee boxes. Bud Arrowood, a beekeeper of this sort, relished his nickname Tightwood. His muddy boots had never stepped foot in a bank because his parents, products of the Great Depression, raised him to "hold on to money." He was the only beekeeper I've seen build a bee box with two nails, diluted wood glue, and three boards. He assured me the fourth side of a bee box was non-essential.

To be honest, Tightwood wasn't much of a beekeeper. Mostly, he farmed, by which I mean fixing broke-down equipment, chasing cows, and culling his farm pond. His family dairy had once been a sight to see, with two towering Harveststore silos, a fleet of International Harvester equipment, and a fine herd of Guernseys.

The farm still had the former two, in various states of disintegration and with much more rust adhered, but the dairy cows were long gone, which suited Tightwood because he was onced gored in the backside by a Guernsey bull. Now he kept beef cattle that ranged through various parts of the countryside, neighbors' property included, because his barbwire fences had degraded to serving only decorative purposes.

Some neighbors considered Tightwood's farm an eyesore, but I appreciated his good eye for valuable junk. I tried to buy several pieces of old farm equipment from him, but, being tight, he never sold anything because he always had an idea for adding value. For instance, he planned to convert an old gravity grain wagon into a mobile duck hunting blind and a rusty grain bin into a gazebo to accent his farm pond. Through the years he had kept a few hives amidst all the junk, but mostly the bees got tired of foraging on rust and absconded for better environs.

Despite appearances of his person and farm, Tightwood was not poor. He had more money-making schemes than any person I ever met. Strangely, most worked. At the farmers' market once, he set up a table across from my honey booth. That was the first time I ever saw Tightwood dressed up, having changed from red flannel to dress blue flannel. He had a sign that read, "Arrowood's Grain-Free Pork." I had my doubts.

"Tighty, what are you doing?" I said, "You can't grow a good pig without grain. Everybody knows that – you won't sell a thing."

"Naw," he said, "They teach them in school now that pigs have weak stomachs. It's got something to do with gluteus free."

"Well, how do you grow a pig without grain?"

"I got a route," he said, "several grocery stores and the Donut Shop. I get all the spoiled produce and stale doughnuts for free."

"So you feed pigs doughnuts?"

"It makes the sausage extra sweet."

"Aren't doughnuts made from grain?" I said.

"No, they're made of dough – don't you know that?"

Exasperated, I went to tend to my booth. By day's end, after Tightwood had sold out of sausage for double the price at the grocery store, I was seriously considering a sign that said, "Bishop's Grain-Free Honey."

Tightwood also kept track of favors. Years ago, he stopped by in his old truck to help doctor on a sick cow. Ever after, he always reminded me that I owed him, even though, I reminded him, he stopped by uninvited and the cow died. Eventually, an opportunity arose for me to shed my indebtedness when Tightwood caught another swarm. Seeing as how he could never keep bees alive, he asked if I would teach him "a few things on bee wrangling." I felt honored. Finally, Tightwood was coming to his senses and realized he needed to learn proper bee husbandry. Still, I was somewhat skeptical. Years ago, I had tried to teach Tightwood about mites, but after performing a sugar shake on his hive, he assured me he had never seen mites before and that those mites must have jumped from my smoker into his hive. Thereafter, when his bees died, they died from my mites.

Tightwood said he was willing to give me a second chance, so one day I met him at his farm for a lesson in beekeeping. He was five minutes late, having just finished his route for free pig food, which was piled high under a tarp on the back of his old truck. I told Tightwood the first lesson of beekeeping was for a mentee to respect a mentor's time and that the problem with tightwads was that they don't value time and opportunity costs. I assured him I could have been doing a lot of other things, like fishing in his pond.

With my first lecture over, we rode over to a dilapidated equipment hedge. The hive was in front of an old grain wagon (or future duck blind). At this point, Tightwood was getting nervous. He was never comfortable around bees and started trying to stall the inspection by studying and reverse engineering my smoker. He thought he could build a smoker from a big baked bean can and fireplace bellow. He told me I was a fool for buying a hive tool and that he could have saved me seven dollars by a little grinding and welding on a piece of iron.

After I refocused him on the goal at hand, working the bees, Tightwood dug through the toolbox on his old truck and pulled out duct tape, welding gloves, and a welding mask. He insisted on duct taping his wrists and ankles and wearing the welding equipment. I told him there was nothing to worry about. In fact, to set a good example, I would inspect the hive sans any protective gear. I told him a good beekeeper can get in and out of the hive without the bees even knowing. He told me I was a fool again.

As we walked over to the hive, a bee accidentally stung me in the neck. I wanted to flail, but knew I needed to set a good example. By this time, Tightwood was already hiding behind the grain wagon, and his welding mask peeped out to ask, "So what does it mean if you got stung before you got in the hive?"

"Nothing," I said. "The bee just more or less ran into me. I should have approached from behind, out of the bees' flight pattern." To illustrate, I circled around, and surprisingly three bees started trying to maul my face off, at which point I started smoking my whole head to try to mask the strong alarm pheromone smell from my neck sting.

"Why are you smoking your hair?" A voice from behind the grain wagon said.

"To mask pheromone." I said.

"What's that about Pharaoh's moan?"

"No, alarm pheromone--it's a banana smell the bees release to warn of danger. It puts them in attack mode. I'm going to mask it with my smoker so they'll calm down."

"I think you're going to need a bigger smoker" Tightwood said. The pheromone smell was surprisingly strong. Still, I needed to show him that a beekeeper who maintains composure has nothing to fear. So I approached the hive to remove the cover. Of course, to save money, Tightwood didn't use an inner cover. So when I cracked the top, bees instantaneously poured through the seam and pounced on my face, at which point I retreated, stumbling and flailing, over to the grain wagon. Tightwood then gave up his position and ran to get in the truck. Indeed, the grain wagon provided little defensive cover, and I decided to join Tightwood in the cab to lecture him on the importance of inner covers. But the old coward locked the doors and wouldn't let me in for fear of letting in bees. So I climbed in the truck bed and got under the tarp with the pig feed. I had gotten stung so many times the smell of alarm pheromone was almost nauseating. When I was finally brave enough to open my swollen eyes again, I thought I was hallucinating when I saw the Chiquita Banana Lady staring me in the face. But I wasn't hallucinating, I was sitting underneath a tarp beside a pallet of overripe bananas.

After driving us out of harm's way, Tightwood opened his rear cab window and said, "I told you you'd need a bigger smoker for masking that pheromone." He said he had learned a lot from my lesson, specifically, "The first rule of beekeeping is no bananas in the beeyard." BC

Beekeeper Nutrition

The Ethics of Food Processing

Christina & Katy **Snoddy**

The pillars of good beekeeping are managing poor nutrition, pathogens, and the effects of pesticides. Cautious steps in every aspect of these increases bee health. Beekeepers are fighting for our bees but are we fighting for ourselves? Let's explore the first pillar. Do beekeepers make healthy nutritional choices?

Beekeepers manage the diets and lives of their bees, testing the viscosity and water content of their honey, or quantifying the number of *Varroa* mites in their hive. Many beekeepers are meticulous about the economy of the hive and monitor everything they possibly can, down to removing drone cells to keep the composition of the hive exactly right.

Most beekeepers are enthusiastic about honey and seek to be ambassadors for honey consumption and use. One fact often quoted is that honey is raw, or unprocessed, uncooked, untouched by commercialization. White or brown sugar, which are ubiquitous in our daily lives do not possess these qualities: they are heated and bleached, a process which leeches the helpful amino acid and minerals from the raw sugar cane. Usually, honey only undergoes one or two process: centrifuging and/or straining, which leave the beneficial side products intact.

Local beekeepers are even passionate about honey they don't make. Beekeepers strive to maintain a high standard of excellency for honey throughout the world, making sure it first fits our desires before we give it to the public. Local beekeepers strive to make commercialized honey producers uphold the same standards they uphold, maintaining the integrity of the honey, including the natural pollen content, which commercialized producers often denude. However, this passion and desire for integrity in honey often does not translate to other food or products besides honey.

Honey is a sweetener, a condiment, a small portion of one's daily food intake. When we buy food, do we take into account the same standards that we maintain for honey? Do we care about how the food is produced? If the food is commercialized? Do we buy and support local farmers or wonder what types of herbicides or pesticides are used in our produce? Do we care that food processing strips the nutritional value out of foods?

Over the course of history, the way we as humans eat and prepare food has changed. Originally, all food was raw. However, with the advent of controllable fire, humans began to cook food, enabling them to travel larger distances and accomplish more mentally and physically. Though methods to preserve raw food, such as salting or icing, developed over time, the next big step in human diet did not occur until World War II, with the invention of vacuum-sealed food packaging. The most obvious example of a vacuum-sealed food is canned food, which most of us have in our pantries. Vacuum-sealing food initially allowed for transport to troops across both seas. After the war, food manufacturers leapt on the idea, which would rapidly accelerate into a multi-billion dollar industry, especially with the discovery of food processing.

Monocultures, or the growth of only one plant, are necessary to deal with the large harvests and high demand for products necessary in food processing. Monocultures disrupt the natural balance in the ecosystem. Monocultures produce food deserts, poor soil quality, and intimately, and often negatively, affect insects, especially bees, who like a balance of nectar and pollen. Monoculture and mass production of food are clearly bad for bees, but they are necessary to maintain the culture of food processing.

Food processing for manufacturing can simply be thought of as altering a food through the use of various chemicals and preservatives for mass transport and shelf life. The International Food Information Council (IFIC) defines processing as "any deliberate change in a food that occurs before it is ready to eat." Under this definition, processing includes pasteurization, dehydration and refrigeration, though there are three stages of processing

classified by the IFIC.

Primary processing ensures food adheres to FDA guidelines. Primary processing includes slaughtering meats, harvesting oats, and picking apples. Products of these processes are called whole foods, which, although "whole foods" is a buzzword, is an actual classification. **Secondary processing** actions are cooking, freezing, and canning. We can think of secondary processing as "simple processing", they can be performed without access to a large-scale, industrial kitchen. The third stage involves adding foreign colors, sweeteners, preservatives, and flavors that are not native to the food being preserved. The third stage produces **ultra-processed food**. It is pretty easy to come up with examples for each stage: a banana is an whole, or raw, food; canned beans are a "simply processed" food; and a candy bar is an ultra-processed food.

Consuming a food in each stage of processing also has a different caloric effect, or effect on energy. Sweet potatoes are a pretty common food in American life. Let's say, for instance, you wanted to eat a raw sweet potato. You would consume 115 calories. Instead of eating it raw, you bake it in your oven. This would be a form of secondary processing, or "simple processing". You would consume 180 calories. Instead, you drive to your local grocery store and pick up some frozen sweet potato fries, which are ultra-processed. You would consume about 400 calories. The advent of ultra-processed foods are directly linked with higher obesity rates, as you can see from this example. If you're eating more calories, you're going to gain more weight.

Have you ever seen an overweight bee or insect? Probably not. Bees gather food in a way that expends a ton of energy. The food sources are raw and are not available all the time. The weather hinders when food can be gathered. Bees don't have food stored up enough to waste; drones are not allowed to overwinter, since food is rationed, especially during winter. Insects haven't figured out how to process food to gain extra calories.

Let's strive to not only to be good caretakers of bees, but of beekeepers. Nutrition is one of the most important parts of keeping a healthy hive. We should strive to commit to being healthy bee caretakers. We can eat less ultra-processed foods, and instead try to eat raw or simply processed foods. We can support local farmers who practice ethical farming strategies, including limiting insecticides, by eating their raw produce. If any industry knows the benefits of raw foods, it's ours. BC

PLATE TECTONICS

That's the Editors License Plate – BEEMAG. He has a personal plate that he pays extra for, and he makes a contribution to the Ohio State Beekeepers Association so he has that extra bit on it, too. What we want from you is YOUR STATE'S Plate, with your beekeeping message on it. But this can work three ways – a simple personal plate that says something like BEEMAG. Or a regular plate that advertises your state association, like the OSBA does here, or your plate like this one that has both. Be Proud of your state, your plate and your message. Show the world your BEEMessage. Send a cell phone shot to info@beeculture.com, with PLATE in the subject box. We'll share it with the world.

Contribute To Your Local Club Newsletter

Around the country you can find probably hundreds of local beekeeping clubs, some large, others small. They hold meetings, workshops, special events and an assortment of other related bee activities. Some clubs have newsletters. But these newsletters can range from just a brief meeting notice, through club business and then up to a several-page newsletter filled with bee news and items "hot off the press."

Local club members can really benefit from a newsletter that gives information to help members, especially the newbees just out of bee classes. At this point you are saying: "it's a great idea but who is going to do it?" In every club there is a member who could put together a fine newsletter – but never got asked. Although it seems strange, some will not volunteer, but when asked to do something (organize the picnic or Christmas party, plan a joint meeting with another club) the response can be an enthusiastic "yes!" So if your club wants a newsletter, go ahead and ask.

This club's newsletter will have an editor, either the new one or someone who has been editor for some time. The editor is the person who puts together the information – meeting notices, club activities, perhaps information about state association meetings and activities, and the articles that will benefit the club members. Here is your chance to become a contributor to that newsletter. Where to start! Walk around your beeyard, inspect some colonies and all the while think of topics you could write about. Did any one idea just pop into your head? Maybe several did. Great. Now go back inside, have a cup of tea with your favorite honey stirred in and start to make a list of topics that would make good contributions to your club's members.

Some of these ideas will be seasonal – swarms – others have no seasons, such as book reviews. Yes, new bee books appear all throughout the year. If you are a bee book lover and are always first in line to acquire a new one, add book reviews to your list of possible articles.

It is important to always keep that club membership in mind. Who are they? Beginners, ones who have kept bees for 30 years, families, city, suburban or rural, cold climate or hot? Actually the list can be much longer than that. They will be your readers. Well, do not expect every member to read every article in every issue. However you do hope that your contributions will be of value to some, some of the time. By the way, do you receive your club's current newsletter? Do you read it, or just set it aside to read "later?" Think about your reasons to read now and read later. Your response to that question will help you plan your contributions. However, remember that you are not the only recipient of the newsletter.

Now it is time to begin working with the editor. Editors have deadlines. They appreciate contributors who meet those deadlines. The editor needs time to assemble the information, make adjustments to the length of articles, announcements and any other information that must be included. Yes, they can refuse to accept articles that arrive after their deadline. If that article was on a seasonal topic it may need to be resubmitted (with any updates) next year! Is your club's newsletter sent via email to all the members or do some wish to receive it on paper, through the postal service? Some areas, especially in the mountains, may have poor internet reception so that paper newsletters may be the better way to reach the club members. In that case the editor's deadline may seem a bit early for the month planned for circulation.

Please, always keep in mind that the editor is a busy club member with other responsibilities.

Now that you have a topic in mind and are eager to write the article, contact the editor and offer your contribution. It is always easier to contact the editor about available space for your article first before just sending in a finished article. Some editors can advise you on the number of words that will fit into their format. That gives you a guide for composing your article. If you just send in your completed article you may find out that it is entirely too long, therefore useless until you rewrite it completely. For composing newsletter articles, keeping the number of words that fit in mind as you write will make writing much easier.

Now that the length of your

article is known and the editor is interested in your topic, start writing. You might have to go back to your school days – punctuation and grammar! Topics taught in schools have really been changing throughout the decades. What was once considered an important part of education has been set aside, then found lacking and reinstated only to be changed again. The results are totally mixed. Some people today can construct good sentences, paragraphs and stories and others seem to have no idea how to do that. Computers to the rescue! Sometimes. Checking spelling takes but an instant. Checking grammar may have you thinking about punctuation and capital letters and other grammar problems you have not thought about in years. Your task is to present a well-written article for the club's newsletter. The editor can change a few minor things, such as should the seasons of the year be capitalized or not, according to preferences. It is not the editor's task to rescue weird punctuation and sentence/paragraph construction in a badly written article.

If your article contains instructions on how to do a particular beekeeping manipulation, such as moving frames around within the hive, carefully review each step. You can do this mentally but you also can print out what you have written, take it to your beeyard, open a cooperative hive and, step by step, follow the directions as if you have not done this before. Does your article make sense the way it is written, or did you overlook an important point? If it needs fixing, then do it immediately after you leave your beeyard before you forget.

Is there a really funny incident you want to describe? Just remember that honey bees plus beekeepers does produce many, many humorous stories. Is yours "just another swarm story" or does it describe something different, unexpected, unique? Don't get carried away with humor. Write the article and then, a day later, read through it again. If you wish, you can read it to a beekeeper friend to get an opinion. Don't be discouraged if the event does not seem quite as funny upon reading it the next day. You can always save the article for another issue later in the year.

Always ask the editor if a regular contributor is writing articles on a topic, such as queen rearing. Those articles may not appear monthly but may appear seasonally. Yes, you could have missed them if you are not a regular newsletter reader. Your approach on the topic may be welcome or not. Don't be disappointed. Bees provide endless topics.

Articles on safety in beekeeping can provide a wide-open field of article subjects. Your article could be about a problem you encountered in your own beeyard or a description involving another beekeeper. If an article you wish to write involves another beekeeper you need to ask that beekeeper for permission, especially if it involves other people. Your article does not need to have names attached to events.

Think through the membership in your bee club. Is there a member who has been keeping bees for 45 years, much longer than any other member? Even though that beekeeper does not want to actually write an article, you could do an interview. It could turn into an interesting biography or a story about how beekeeping has changed over the years. What advice could this long-time beekeeper give to the newbees in the club. Ask questions and listen. You could end up with a long list of topics for future articles.

Today it has become common to find a family – parents and children of all ages – being a beekeeping family. You can consider an interview with them – what started their interest in bees, how are the children participating. An article about one family may encourage other families to involve their children.

Now you need to visit the internet. Your club members probably cruise the internet for an assortment of information, not necessarily about bees and beekeeping. You need to keep up with everything going on in research and the organizations for pollinators and honey bee health. You will probably find so many topics that you won't be able to use all of them until new information appears. Select what you think your club members can use.

Subscribe to CATCH THE BUZZ (*Bee Culture*) and Bee Informed Partnership (BIP). There is another website for beekeeping news, Items for Beekeepers. To subscribe contact **rosannamattingly@gmail.com**.

You have plentiful sources of article topics. Working with the newsletter editor, decide when is the best time to submit your first article.

Get busy! Write it. Look at your word count. Uh Oh – you got carried away and now you must go back and revise. That's normal for early attempts. You'll improve.

Your article is now within word count. Don't forget spelling and grammar check. Fix anything needed. STOP! Do not send it off now. Tomorrow is another day well within the deadline. Do something else. Visit your bees. Forget the article.

Now it is a new day. Open your article and read it. At this point you can change a word, a bit of punctuation, nothing major. Your first article contribution to the club's newsletter is ready.

It's time to SEND! Congratulations!

One thing is certain – when this month's newsletter appears, whether by email or printed, it will not be set aside for the usual "later." BC

Ann Harman critiques newsletters from her home in Flint Hill, Virginia.

CALENDAR

♦INTERNATIONAL♦

2019 Beekeeping Tour to Cuba, November 9-17. Learn how the Cubans do it!

Arrangements by: Transeair Travel LLC 2813 McKinley Place NW, Washington, DC 20015, 202.362.6100 **blubic@aol.com Website: transeairtravel.com**.

Apimondia 2019 held in Montreal September 8-12. For more information visit **Apimondia2019.com**.

♦GEORGIA♦

Georgia Beekeepers Association will hold their Fall meeting September 26-28 in Cumming.

Speakers include Jennifer Berry, Leo Sharashkin, Clarence Collison and Lewis Bartlett.

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

♦INDIANA♦

Indiana Fall Conference and Workshop will be held October 25-26 at French Lick Springs Hotel.

The keynote speaker is Randy Oliver.

For more information and to register visit **http://indianabeekeeper.com/**.

♦LOUISIANA♦

The USDA Honey Bee Breeding, Genetics and Physiology laboratory and the LA State Beekeepers Association will hold their 23rd Annual Field Day November 2 at the lab, 1157 Ben Hur Road, Baton Rouge. Rain date November 9.

Gates open at 9:00 a.m. with program starting at 10:00 to 3:30 p.m. The fee is $35/adults, non-refundable. Pre-registration begins Ocboter 2.

For more information visit **labeekeepers.org** or contact Frank Rinkevich, 225.276.3998 or **frank.rinkevich@ars.usda.gov** or Joe Sanroma, 318.346.2805. For questions regarding online registration contact Jennifer Brown, 601.493.3447.

♦MISSOURI♦

Missouri State Beekeepers Association Fall Conference will be held October 18-19 at Moberly Area Community College, Moberly.

Keynote speakers include Peter Borst and Krispn Given. Others include Collin Wamsley, Casey Berthoud, Dheldon Brummel and more.

For information contact **brucesnavely@hotmail.com**.

♦NEW YORK♦

Beekeeping For The Future November 16, 9:00 a.m. to 5:00 p.m. at The Pfeiffer Center, Chestnut Ridge.

Registration is $95.

Instructor is Bill Day.

For information visit **www.pfeiffercenter.org/workshops**.

♦OHIO♦

Lorain County Beekeepers Association 100th Anniversary Celebration will be held October 5 at the Lorain County Fairgrounds starting at 5:00 p.m.

All area beekeepers are welcome.

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

♦OREGON♦

The OR State Beekeepers Association will hold their Fall conference October 25-27 at the Florence convention Center, Florence.

Speakers include Priya Chakrabarti, Jay Evans, Brandon Hopkins, melanie Kirby, Andony Melathopoulos, Michael Palmer, Ramesh Sagili and more.

For information visit **www.orsba.org**.

♦VIRGINIA♦

Principles & Practices of Biodynamic Beekeeping, Part Four: Fall & Winter - September 7 at Spikenard Honeybee Sanctuary.

For more information visit **www.spikenardfarm.org**; **info@spikenardfarm.org** or 540.745.2153.

Farming & Gardening: Biodynamic Principles and Practices - September 26-28 at Spikenard Honeybee Sanctuary.

For more information visit **www.spikenardfarm.org**; **info@spikenardfarm.org** or 540.745.2153.

♦WASHINGTON♦

The Northwest District Beekeepers Association will present an education and fun conference, September 21 at the Snohomish PUD Auditorium. The cost is $20/NWDBA members and $30/non-members. Seating is limited to 300 and expected to sell out.

Speakers are Andony Melathopoulos, Randy Oliver and Kevin Oldengurg.

To get your tickets visit **https://www.brownpapetickets.com/event/4248173**.

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I'm committed to a hive demonstration at a bee club in a couple of weeks in the Far Corner of Colorado. A club member is my close confidant in all things *apis*. We trade favors, and advice. So when I asked her if she'd advertise to the club that I have bees for sale, and could bring some with me, she said of course.

Then, almost as an afterthought, she said, "We don't have any American Foulbrood (AFB) in the Far Corner. You wouldn't be bringing any of that stuff, would you?"

She knows I had a case of AFB in March. I mentioned it in this column. I didn't think much of it. I told my confidant, "I don't sell diseased bees. And of course you have AFB. It's everywhere." She lives in the Far Corner, at the edge of the Great Basin, not on a Pacific atoll.

"We don't have it here. I know what it looks like, and we don't have it" she insisted.

"That you know of . . ." I countered.

"No, we don't have it, but if your bees are healthy, no problem. I'll put out the word to the members. But if we start finding AFB in the Far Corner, we'll know where it came from."

My taking personal responsibility for the health of all of the bees in the Far Corner seemed a heavy burden to bear, but I soldiered on.

I told my confidant that I planned to emphasize "shortcuts" in my Far Corner Bee Club hive demonstration, and I outlined a few specific ideas for how my sideliner experience could benefit backyarders with a busy schedule. She suggested my timesavers wouldn't be practical for this group of largely beginner beekeepers, but I begged to differ. "Say anything you want," she cheerfully concluded. "I'll do damage control after you leave."

My confidant has pluck, I'll say that!

The wise Marilyn recently explained to me that I am no longer a young man, and that I should accept – and even seek – offers of help for my one-man bee business. Don and I worked a lifetime together on the ski hill. I had no idea he recently took up beekeeping, until he showed up at the state bee meeting in June. When I suggested he might help me haul bees to their summer pasture on the high-altitude Flat Tops, he leaped at the opportunity.

Moving day I had the trailer all loaded. We took the beast, my 1983 Ford E-350 flatbed with the 1978 rebuilt 460 engine and aftermarket four-wheel-drive. She packs a load. You never saw such a rig. Some creative and possibly deranged mechanic cut out the middle of an E-350 van, then welded the back couple of feet onto the front of the vehicle, right behind the driver's seat. Then he put a 12-foot flatbed on the end of that. The roof leaks. The paint's long gone, and the cab is cracked and starting to seriously deteriorate. No rust, however, here in arid Colorado. The beast's a marvel and a jewel, and she's paid off.

We were hauling a 2,000-pound trailer with 20 double-deep hives on board. That 460 engine purred as we eased up the hill, until suddenly steam came flying out of the engine cover, inside the cab. We'd blown the radiator. Coolant sprayed onto the hot engine like water from a leaky garden hose.

We dropped the trailer right there on the county road, got the engine cooled down with water from a roadside creek, and backtracked for home. We had no problems driving mainly downhill to the farm. There we jumped into Don's pickup, headed back up the hill, and hooked up that trailer full of bees that we left on the county road. Don got us to the bee yard by 10 a.m. It was still cool

at 9,000 feet, and the bees were just beginning to feel their oats.

Once we got the little darlings off-loaded, we put up the solar-electric bear fence and opened some hives. I taught Don to count Varroa mites. I know how to say thank you when someone saves my bacon. At day's end I offered Don a nuc for his efforts, and he accepted.

Eight hundred dollars later, I had a new radiator. The beast was back.

Two weeks after our adventure, I needed to get a load of exceptionally heavy hives moved onto my trailer. These bees were bound for a different yard on the Flat Tops. I couldn't afford to miss the Dwarf Waterleaf honey flow, so I called Alicia. I sold her nucs this Spring, and she's all gal. When we skied together last Winter, I couldn't keep up. In return for her help, I promised her a hive inspection and lesson in mite monitoring.

She gave a boost each time I pulled a hive-laden hand truck up my trailer ramp. We got 'er done, and Alicia seemed to enjoy herself. I'm grateful.

The morning after I initially talked to my confidant about selling bees, I called her again, good and early. She sounded sleepy as I explained that I won't be selling bees on my upcoming visit to the Far Corner. I don't want to be the one blamed for bringing AFB to that enchanted Shangri-La. A hundred years from now, I don't want some Far Corner beekeeper to say, "We never had AFB until a guy who wrote for *Bee Culture* sold some bad bees down here. That's when it all started."

I just couldn't bear the burden.

Ed **Colby**

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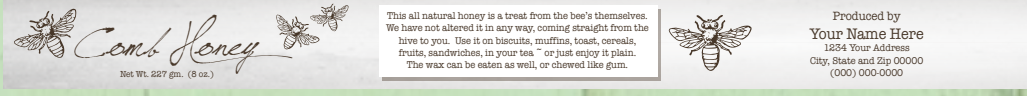

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