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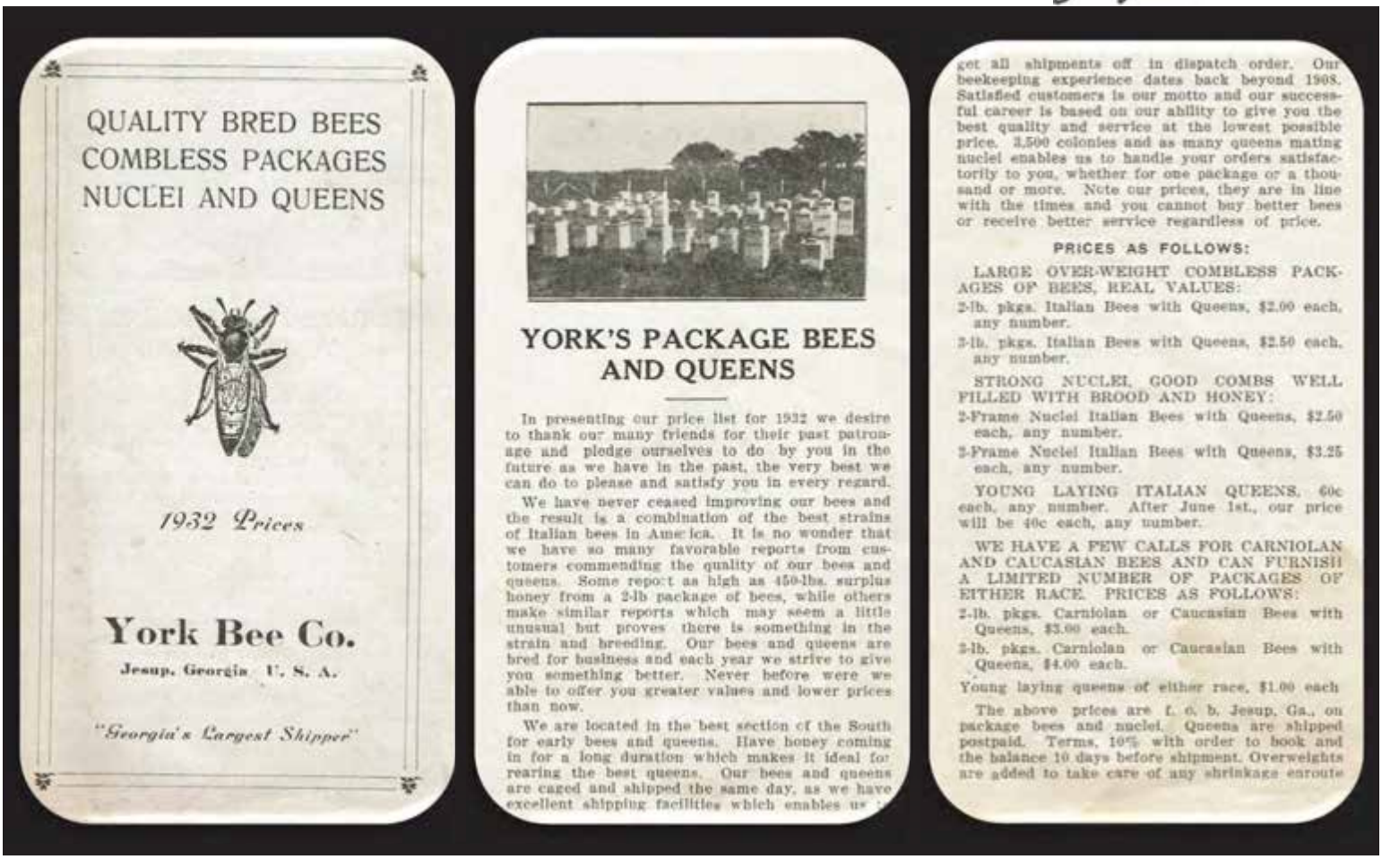

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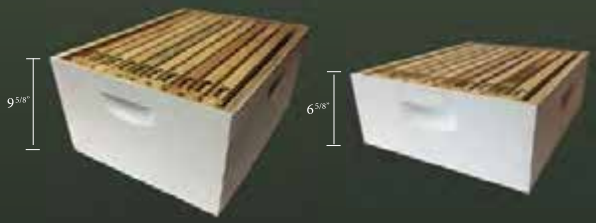

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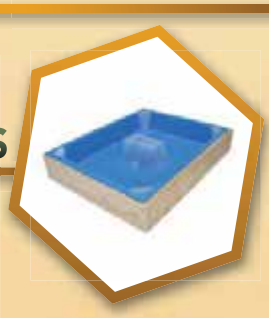

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Bee Culture

October Features . . .

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Fall blossoms like goldenrod and asters should be a bonus crop for bees, not the make or break honey crop for their keepers. (Flottum photo)

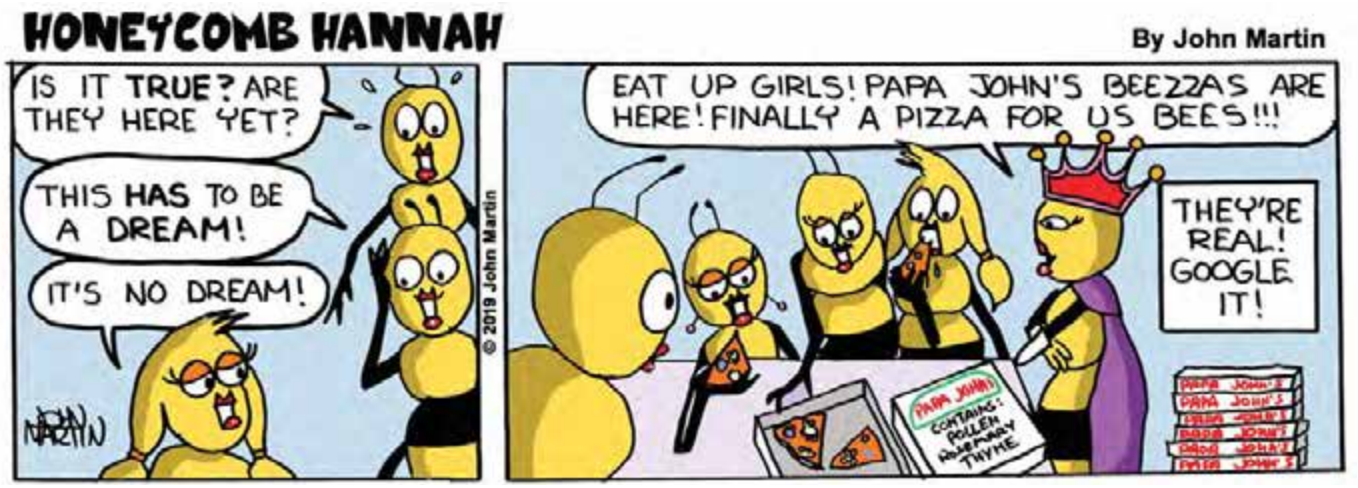
PLATE TECTONICS

In the September issue we asked you all to send in your bee related license plates. We got so many we can't fit them all in this month. So keep sending them and we'll put another page in the November issue. Send a cell phone shot to info@beeculture.com, with PLATE in the subject box. We'll share it with the world.

Watch For More In The November Issue! Thanks To Everyone Who Sent In Photos.

Bee Culture's Best . . .

In Every Month –



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Illinoian Of The Day

My dad, Gene Killion was named Illinoian of the Day by the Department of Agriculture at the Illinois State Fair on August 12, 2019. The ceremonies were held in the Illinois State Fair Museum located beneath the grandstands. He handed out silver trophies, among which included the Carl & Eugene Killion trophy, to the first place winners of the Illinois Honey Show. The Miss Illinois County Fair Queen is Alexi Bladel from the Rockford, IL area.

Jim and Karen Belli won the Carl and Eugene Killion award. The Illinois Director of Agriculture is John Sullivan (tallest fellow in green shirt in the photos).

This award came out of the blue to us via a phone call I received from Angie Fletcher who works directly for John Sullivan. She said John and the entire department wanted to honor Dad in this way. John presented Dad a trophy and a limited edition photo of the main entrance to the fairgrounds and also tickets for many things at the fair that day. The award presentation was preceded by a beautiful speech that the director gave regarding the work Dad has done throughout his life to benefit the beekeeping industry and for his work regarding the promotion and protection of the world's most valuable insect.

Proud Son
Mark Killion
Paris, IL

Gene Killion second from left.

Are We Helping?

Last week I found myself having the usual water-cooler talk at work: a time-honored format which usually begins with politics, then moves on to the environment and concludes with the all-important analysis of available lunch options.

It was on the topic of the environment that my colleague seemed particularly deflated that day, asking me if I agreed that the earth was more-or-less a lost cause. I confessed I felt no such despair. As beekeepers, we are actively involved in making a difference in the world, and it occurred to me that was why I did not share his feelings of powerlessness concerning the condition of our planet.

Take a moment to think about the various ways in which you, as a beekeeper, are actively improving the state of the environment. Not all of these are as obvious as the big one: our ensuring the survival and health of the world's favorite pollinator. Nor are we always conscious of the beneficial effects we are having on the wider world: many of us are simply seeking to make a profit from our honey, and there's nothing wrong with that.

I am willing to bet that *Bee Culture* readers take part in several, if not all, of the following beneficial practices: eschewing the use of pesticides on their property; educating others about the importance of pollinators, however informally; improving forage for native bees, and providing larval food for butterflies, through planting forage for their honey bees; actively participating in environmental advocacy, particularly in regard to pesticides; and let's not forget that we all are producing a sustainable food product without the need for any of the destructive practices associated with modern agriculture.

In the face of today's ecological despair, the best remedy is to go out there and make a difference. As a beekeeper, you're already doing just that and, if you feel so inclined, try to think of additional ways you can use your position to protect and restore this planet we, and the bees, love so dearly.

Peter Keilty
New York, NY

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What's Going On?

The phone rang, startling me out of my almost trance like focus. It was my wife. "Hey, are you ok? She asked. Startled, I looked at my watch and realized that I have been gone for over an hour. When I left the house, I had told her I would be back in 15-20 minutes. What I had not expected was that the local sporting outfitters store in the small town we were visiting, had a surprise in the far back corner. Nestled between bicycle parts and women's active apparel, was a fully functioning, active, honest to goodness honey bee hive. I stumbled on the hive while in search of some parts for a bicycle. There was really no rhyme or reason for its placement (so it seemed) and there was no warning for what was there. But there it was, 20 frames in a fully transparent enclosure teeming with life and activity. The observation hive (as I would later learn is its name) was covered in honey bees "going about their business." The activity was frenetic but there seemed to be a rhythm, an elegance in the way the bees were moving. I wasn't sure what I was watching but the bees seemed to know exactly what was going on. I noticed that under their "feet" was an iconic design that I thought I recognized as "honeycomb." The comb seemed functional, useful, almost alive. It wasn't perfect like artist renderings, rather it was dark, and light, covered and filled with "stuff." Odd shapes poked out from its surface. Some were covered in odd little domes, a couple around the bottom looked like boiled peanuts (we were

in the South after all) Some looked like they were filled with something wet in them, others contained small white "shrimp" and some were brightly colored.

What is going on in there? Little did I realize just how much that question would change my life!

My wife told me "Supper was ready, (In the South we have three meals, Breakfast, Dinner, Supper) and I needed to hurry home. I scanned the area and located a couple of books on beekeeping on the shelf close by, *Backyard Beekeeping*, Kim Flottum, *The Hive and the Honey Bee*, Langstroth. The remaining days of vacation included a couple more trips to "Werners" and with each trip a little more recognition of what was happening, thanks to my teachers, Flottum and Langstroth.

Since that fateful day, my affection for this remarkable insect has continued to grow. I joined a local beekeeping club and then founded a club closer to my area with a couple of other "Newbees." Today our club presence reaches well over 300 who associate with us online. Our club has contributed signifigantly to support the newest honey bee research lab located in Gainesville FL. We have assisted over 100 First time beekeepers get their start in beekeeping. We stay active in assisting and encouraging their ongoing education. Our club apiary is maintained as a model of Best Management Practice (BMP) providing opportunities for hands on experience. Our club motto, Education, Pollination, Repopulation, plays out through community outreach and monthly meetings.

But, to this day, the most magical moment is still this. The presentation is over, most of the folks have left and I head over to gather my observation hive. Someone is lingering, just watching the activity in the hive. As I look closer I think I recognize that look of wonder just starting to flicker in their eyes. It is almost a reverent moment and I hesitate to interrupt. Finally, they look up and ask, **"what is going on in there**?"

Stuart Rowan
Melbourne, FL

Better Bees

I started beekeeping around the late 70s. I had Midnite bees. They were gray and black. They were the best bees that I had until the beginning of the 80s.

The mites killed all eight hives I had. No one knew what to do.

I stayed out of beekeeping for about four years. Then I started back up. But this time I got a few Italians and had to treat them with Apistan. Then I had Russian bees.

I have not treated any of my Russians for about five years. I get my queens from Vermont only.

Keep your bees in the full sun and requeen every three or four years.

Donald Fradet
Louisville, KY

Land Loss Article!

Thanks for such a great article. My issue came today and as always, dove right in to it.

The opener discussing three acres of farmland disappearing every minute hit home. We are small farmers here in Georgia with about 300 acres most of it rented to a cotton farmer. We do Pecans, Blackberries, Cane Syrup and run about 75 hives of Bees and some vegetables between floods and drought.

In May we learned of a large waste company has an option to purchase 1000 acres near one of our tracts for a "State of the Art Landfill." There is a lot of opposition and a few supporters. I am a major voice of opposition.

Trying to build a solid list of opposition facts and figures has been daunting and time consuming. Loss of farmland is on our list and your article describes it really well, much better than most I have compiled.

I would like to use some of it, or all of it to present to our county government should the landfill proposition ever get that far.

Thanks for your great articles, books and service to the beekeepers.

Alan Stewart
Sylvania, GA

No Help For Bees

A farmer planted alfalfa in the field next to where I live. I have 30 hives on that land and 30 queen mating boxes.

I have a verbal agreement with the farmer and land owner that when he has to spray the farmer would give me 24 hours notice.

August 5, the spray rig pulled into the field and started to spray pesticide for leaf hoppers. I stopped him and told him about the bees. He didn't spray anymore and left. The field is in 1/3 bloom! DE Dept. of Ag called and said that I can't stop a farmer from spraying and it would be sprayed the next day, August 6.

I moved my 30 hives that night but couldn't move the queen mating boxes, because we just put ripe queen cells in six days before. These boxes are about 300 feet from the field.

The next day they sprayed the field, while DE Environmental Program Manager watched and had NO concerns. He didn't know the chemical. He said he'd have to look it up and they would be spraying the field again in two weeks and the field will be in ¾ bloom.

Dept. of Ag said there's no law that says you can't spray a field that's in bloom or any law that says the farmer has to contact the beekeeper when spraying.

Head of EPM, Jimmy Hughes, said if the spray says "Should not be sprayed on bloom or around bees," that's just a warning. If the label says, "DO NOT spray on blooms or around bees," that's different. It's all in the wording. EPA said it's up to the state.

Four days later I found two dead Monarch butterflies and some dead bumblebees.

Bob DeYoung
Delaware

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Number 1 Tip of the Month – Keeping Track of Queens

I keep detailed records for each queen among several apiaries. Naming queens has always made more sense to me than numbering hives. I created a system where I can instantly tell the queen's age and her apiary of origin by her name alone. I do this by assigning each apiary a specific theme such as "Food," "Beverages" and "Music". Then I use the international queen color marking code to mark the queens. I will also mark the queen's Name and her color on the telescoping cover.

For example, I have a yellow marked Queen from 2017 in the Beverage apiary I've named "Queen Mead." I can instantly tell that she's two years old, marked yellow, and will likely be re-queened this year as she's getting on in age. In the Food Apiary, I have a Queen Sriracha who is marked Red (2018). If I were to move her to a different apiary, I can still track her apiary of origin and I can see that she's still got another season in her but should be requeened in 2020. Currently, 2019 (green year) in the Music apiary we have a "Queen Kermit." She's a great queen, but as the song goes: "it's not easy being green."

Brenda Nye

International Queen Marking Color

COLOR	FOR YEAR ENDING IN:
White (or Gray)	1 or 6
Yellow	2 or 7
Red	3 or 8
Green	4 or 9
Blue	5 or 0

Bee Culture wants you to share your good ideas with our readers. Be precise and include a photo or sketch if possible, but that may not be necessary. If we use your idea you get a free one-year subscription. The best each month gets $100.

I have to install wax into the wooden frames I use in such a way that the extractor does not cause the pulled wax with honey to box when the honey is extracted. I have a wiring board that helps with that problem.

When I began beekeeping in 1999 I did not wire any frames and only depended ont he wired foundation with hooks to keep the wax from buckling under heat or the pull of the extractor. I soon discovered that I needed to wire all the wax sheets I put in the wooden frames or I was losing wax from either heat or the extraction process.

The board in the picture is the set up I use. It also allows me to use a battery charger to melt the wax into the metal wire. The board is adaptable to full sized deep frames or super frames.

Sandra Center
Omaha, AR

I have been extolling the virtues of the Dry Swiffer for small hive beetle control for a while now, but the photo attached opened my eyes to its potential for varroa control too. While no substitute for a good blast of oxalic, I figure every little helps. I am also considering it as a substitute for my removable bottom boards, when I dust the bees with icing sugar to stimulate grooming, now that I have seen how effectively it traps varroa mites, and not just shb. Thanks!

Peter Keilty

For Small Hive Beetles use four strips of ***white*** moist wipes. The colored ones will not work. Cut four strips an inch wide and place them on top of the brood frames. They get tangled in these strips (the bees have chewed up) and die.

I have not done any extensive test, however, I think the mites also get tangled up and die.

James D. Ranné
Mullin, TX

Keep It Simple

I keep four hive tools in a honey bucket with some soda wash (1 kg washing soda – NOT caustic – and a squeeze of washing up liquid) and a pan-scourer. Clean hive tools ae so much easier to work with.

Fully open mesh floors screwed to pieces of fence post front and back and a 7mm entrance – no need for mouse guards – and colonies do not overheat with the excellent ventilation. They do not build drone comb on the bottom of the frames. Hives are very easy to strap up for moving and the bottom ventilation is ideal if you are shutting bees in.

I use ekes and keep them above the crown board. Bits of broken brace comb with honey in are put there and will have been cleaned up by the next visit.

Always drop set honey into the center of the jar when bottling – running it down the sides will result in white streaks when it sets firm.

Peter Keilty

Utilizing a 15-gallon Kelley Heated Grocer Tank to collect condensate on inside tank cover. By heating honey to 120°F and placing ice packs on top outside cover and placing cloth over pacs to slow down the warming of ice packs I was able to reduce moisture content of honey. You carefully lift cover four to five times a day to wipe off accumulate condensate.

The Experiment: We are often tempted to extract end frames which are only partially capped after passing the shake test, which raises moisture content.

Batch 1: With 14 gallons of honey in tank reduced moisture from 18.1 to 17.4 in four days.

Batch 2: with seven gallons of honey in tank reduced moisture from 18.1 to 16.9 in five days.

I discounted possibility of condensate coming from headspace air as virtually no condensate when honey at room temperature with ice packs on top. This method may be of value to small producers who have time.

Joe Fitzpatrick
Blue Bell, PA

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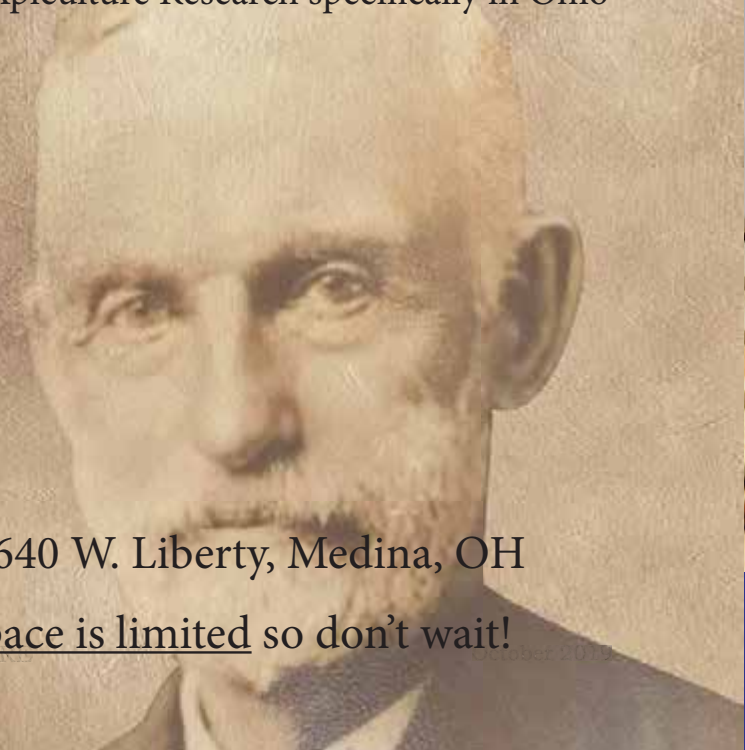
Jim Thompson discusses equipment from his extensive collections
Malcolm Sanford discusses the history of Apiculture Research specifically in Ohio
Kim Flottum C.P. Dadant
Ellen Tuper
Plus much, much more!



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INNER COVER

It's been a quiet month here in the Spieth Road Beeyard. The weather settled, kind of, and things started to dry out a bit after the monsoons of June and early July. Hot was the norm, but with all the moisture in the ground the honey flows pretty much didn't stop and from what I hear beekeepers, and their bees, did pretty good. August harvests were as good and for a lot of us better than normal in this part of Ohio. The best part is that as I write this the goldenrod bloom is just starting, maybe just a tad early, but right about on time. This will be a good test of the rain-rule for that Fall bloomer – No Rain In July, No Honey In September. That's held pretty steady since we worked on it with the botany folks decades ago when I was at the University in Madison. Back then we had a good goldenrod flow some years and some years none, no matter the August or September weather. The botany folks looked at nectary formation just as flower buds were forming – in July – and found, they said, that if there was water stress in July, there'd be no, or diminished, nectaries formed to produce honey in September. I'm not a botanist, but it makes sense, and that's been pretty much dead on all these years here in Ohio. So, we should have a good goldenrod crop. Still, everybody has their fingers crossed.

•

Did I mention we had supper with Jim and Vallie Tew just the other night? They live about 30 miles south of us in Wooster and we met at a restaurant about half way between. They brought us up to date on that new development that's going to go in right next to their beeyard way sooner than they want.

We were down there about three weeks before and did a KIM&JIM Webinar to take a look at all this craziness (you can see that program on our web page if you want). We brought Johnny, the tech guy from our office who makes these webinars work for us, so he could monitor everything from right there rather than do a remote from back at the office. He's a hand's on tech guy and in fact he brought his drone that has a video camera to give us, and you, a bird's eye view of the field that will be the grounds for the development, plus the forests and the few houses that are on the edge of what was just last year a corn field.

This is going to be a mess and a half for all those Wooster folks who have been living the quite life on a dead-end street next to a corn field all these years. Suddenly they'll have school buses, fire truck sirens, garbage trucks, gangs of adolescents, city snow plows and salt trucks, fertilized and poisoned lawns, morning and evening rush hours, police patrols, rain runoff and all the rest of our urban ills right next door. All told, there's 20 some acres going under the grader and houses are going to go on quarter acre lots. That figures to 70 some new houses, garages and driveways, yards and families and dogs and cats all sprouting up like mushrooms after a rain storm. Plus, yes plus, there will be a two or three mile asphalt grid of streets serving all these new folks, and twice that in concrete sidewalks laid out. All this snuggled right up next to Jim's beeyard.

They've had the Mayor and other city administrators – police, fire, garbage, ambulance, school - out to look, but you know the story – progress, growth, jobs, new taxes . . . Nope, it's welcome to urban America folks, and 20 some acres of chaos right next door. If you recall that report we did last month we lose about three acres of farmland a minute and in the time it took you to read this we lost about 10 acres. But don't fret, there will be at least 10 more gone by the time you get to the bottom of this, and Wooster, you got 'em all.

•

For more reasons than I can get on this page, for the last about five years the third bedroom in our house hasn't been the office. It used to be, then wasn't, and now it is again. The desk butts up to two second story windows so if I look straight out, I'm looking at the trunk of a really, really tall sycamore tree about 30 feet away. It throws out its first branches about right even with the top of my desk so it doesn't block much of what I can see. To the left of that tree is the neighbor's backyard, to the right further away a couple of not quite as tall trees, and just past them the neighbor's front yard, and then the road that goes by our house. Front of our house to my right, backyard to the left. I'm facing east. Right next to this side of the house just to the right of my windows is one of our beehives, and, from where I now sit, I can see bees raising up, flying way, way up over the trees in front of them. Not, mind you, going around all these trees on either side, which, at most, would add about 40 feet to their trip. Rather, they fly up, oh, at least two, maybe three stories, then back down to about 10 feet high, and off to the forage they know is out there. Why up, and not around?

It's Been A Quiet Month.

I know bees do the beeline thing when heading somewhere, at least most of the time. Up and over houses, trees and the like heading out, or back. There's been some work on how much water they will fly over to get to where they want to be but water isn't the issue here. And, if you're at all familiar with the dances of bees, they don't do a 'go left around the trees just out front, then straighten out and head due south till you get to the field that smells like I do right now' waltz ever. It's just 'go south young lady, go south'.

What caught my eye from my new perspective was in the afternoon, when the sun was in the west sky, and not yet behind the house, sun light would shine off the wings of those rising bees, heading straight up over those trees. Once you noticed that phenomena it was all you could see. Streaks of flashing wings rising from right below my window out of sight above my window, heading up, up and away.

So I ask again, why straight up and not around? It seems like a lot of unnecessary work, but then, what do I know? It does save a lot of time and energy when giving directions. I wonder how'd they do a waggle dance with a quirky left around the trees then back to that straight line I just showed you?

•

By the time you get this the Apimondia conference in Montreal will be history. We plan to be there and will be doing some interviews, visiting the vendor tables, reading all the posters that will be shown and catching some of the talks, workshops and symposiums. Back in August Jeff and I did a Beekeepingtodaypodcast with Steve Pernell, the scientific program chair who shared a lot of both what goes into planning one of these events, and what has been planned other than the scientific portion of the week. For this conference he has the same job that Mark Winston did back in 1999 when Apimondia was in Vancouver, British Columbia. We were at that one and had a booth and won a Gold Medal for our magazine, plus gave a talk about information transfer in the beekeeping industry.

But a whole lot has changed in those 20 years. Especially information transfer. The internet and social media certainly lead the way. Podcasts, webinars, email, web pages, smart phones, online shopping and classes and entertainment and everything and anything you want to do or see or hear or read or learn or people you want to talk to or read about and instant news and weather from anywhere in the world any time of day, any day of the week.

So, we will try to take advantage of some of that this time. In the past few years when we've been at conferences – EAS or ABF or AHPA mostly – doing exactly that. We've done some FaceBook live events at several of these conferences. We visit vendors who tell us about what they have that's new, different, better or whatever, or we'll grab one of the speakers and do a quick interview, and we broadcast it live for anybody who wants to watch. All you need to do this is a smart phone, somebody to hold it, and somebody that knows how to use Facebook. I'm not that person, but Kathy is and we are getting pretty good at this.

Because these are done live it can get a bit dicey sometimes. We were talking live to a vendor at one of the meetings with several hundred people watching (your phone will tell you exactly how many the whole time you're recording), and a customer came up and started asking questions. She wasn't being rude but didn't realize what we were doing and just kept talking. Fortunately, the Vendor didn't get flustered, and the customer didn't do anything akward, so it worked out. I was on camera so I made a comment something like well, we'll get back to these folks in a bit when they have a few moments free time, and we moved on, kind of like it was supposed to happen. Thinking fast pays off when you're on live. But not only are these events live, they are recorded on our FaceBook page so if you missed the live event, you can watch it later, when you have time. And, the vendor can capture the recording and send it to all of their FaceBook followers, so it's essentially free advertising for them. We get a lot of cooperation because of that.

We give everybody a heads up the day before (including you on Facebook) so they know about when we'll be there so they are there, and they can have whatever it is they want to show ready and right at hand. Most of them actually rehearse a bit so they don't get flustered. It makes them look good, shows off their product, and folks tuning in don't waste their time watching people stutter or search for words or just not do it well.

I'm assuming we actually did some of these while we were there, that our equipment worked, and, and this is the biggest problem we have, we could get a phone signal in the building. If we lose that we are out of business. Or, we have to drag a vendor or speaker to some place that does get a signal. That's a pain and we don't do much if that's the case. So, if you didn't see anything, or, you go looking and can't find anything on FaceBook you'll know why.

However, I will be recording a bunch of interviews of these same folks to use on our podcast, and you don't need a signal for that. Just my phone and a mic. And we'll have two phones so one is a backup. And, when you finish you don't need to store the recording, you simply put the file on the Dropbox app on the phone and send it to a couple of people so you have it twice and then delete the whole thing from your phone. So check out the BeekeepingTodayPodcast.com web page for those, too. And when I get back I'll tell you all about the other stuff at the Apimondia Conference. Stay tuned.

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It's Summers Time –

Things Are Always Changing

Nothing ever stays the same forever – or does it. I've been at this job for what seems like forever, in a good way. I love it here. And some have asked me "Don't you get bored!" The answer is no. There's never time to get bored – here or at home. That is a word that is almost never in my vocabulary. I think boredom – like joy – is a choice. There's work, and the bees and the chickens and the ducks and the cats and the garden and the yard and the house and time with friends and church and kids. So we are never bored – we are often tired, but never bored.

Soon my life at *Bee Culture* will be changing. Kim has been talking about his retirement, so you all know it's happening sometime soon. So soon I'll have a new boss. We're pretty close to being able to tell you who that will be, but still some details to work out. But in the next month or so we'll be making that announcement. I'll be here for awhile longer and Kim will be around on a part time basis working on some special projects. So life won't change too drastically right away.

I've been blessed and kind of spoiled working here at the Root Company all of these years. It allowed me easy access to my boys when they were growing up. I could be there in five minutes if I had to – school or home. That was huge to us. And even after I moved to Spieth Road with Kim, we're still only seven miles away – 15 minutes on a really bad day. Life has treated Kim and I very well here in Medina, Ohio.

We had to grab each of those ducks and clip their wings this past weekend. Kim and I were sitting on the deck one late afternoon and watched as a male and a female flew right by. They looked beautiful as they headed for the neighbor's yard. The funny thing is then they panicked and ran back to the pen, where all of their friends are. The male especially had been flying quite a bit, so it was time.

Our poultry population sometimes seems out of control. We are at 28 birds right now – 14 hens of various ages ranging from almost eight years old to two years old, then seven young hens born in April and the seven ducks born in April. All are doing well as we wind down the Summer. We have one older hen that gets out almost everyday, often meeting us in the driveway when we get home. Then she'll wander over to the pen and just wait by the gate until you come and open it and she just sort of strolls in. She has spent a couple of nights outside though, when she didn't make it home in time. Who knows where she goes. Update on our little cripple girl. She's doing just fine. Her limp is hardly noticeable now and she gets right in the thick of any scuffles that go on. She's still a bit smaller than the others and doesn't really have a comb or a wattle. She probably won't be an egg layer, but that's okay. We'll let her stay. It's what we do.

There's a field across the road from us that a guy comes a couple of times a year and cuts hay. Last weekend was his time to come. After he got all done we watched at least nine vultures sweep that field. From a distance I thought they were wild turkeys, which have come back to our neighborhood, but then realized it was vultures. I'd never seen that many in one spot before. It was a little scary. And it was mayhem in the hay field for all the mangled little creatures they were feeding on.

I got Kim a drone (the mechanical kind) for his birthday and he wanted to go over to that field to practice. It was amazing the amount of small dead things we saw. So the vultures chose a good spot. The drone, well, we still need some practice on that.

On our recent trip to Wisconsin for the Flottum Family reunion we took about a dozen philodendron cuttings in the back of the car. They came from a plant that Kim has nurtured for about 40 years. It was a plant that he gave to his mother and she has been gone for many years. He gave one to each of his siblings and the several nieces and nephews that were at the reunion. I never got to know Edna Mae, but I'm positive that this would have made her smile.

I just realized that with this October issue I'm starting my 30th year of layout and design for *Bee Culture* magazine. Not bad for someone who walked in barely knowing how to turn on the computer. Life is a journey and you just never know where you'll end up.

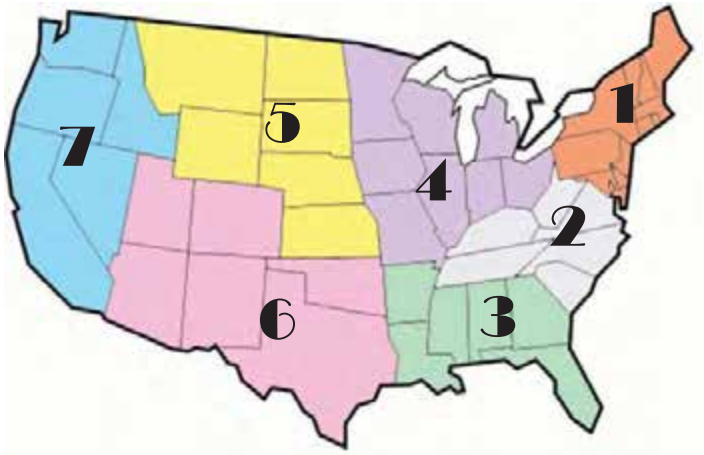
Kim and I are headed to Montreal this weekend for Apimondia 2019. I hope to see some of you there. I'm excited about this trip. I've never been to Montreal. We'll make a full report in the November issue. Then Kim has some other short trips lined up for the Fall to Connecticut, Mississippi and Lousiana. Pretty full schedule for someone who is supposed to be slowing down.

Our October event is coming soon. You can still sign up. A Fall trip to Northeast Ohio would be a wonderful thing. It's beautiful here that time of year.

Hope to see you somewhere along our travels. Whatever your particular Fall looks like, enjoy.

Kathy Summers

OCTOBER – REGIONAL HONEY PRICE REPORT



We asked our reporters this month about honey prices going into the new season. It's a mixed bag on what prices are doing overall, with cheap and cheaper imports demanding attention, while local honeys are holding their own, and, in fact, rising to meet increasing costs. So, what are our reporters doing? 18% are going to increase prices this year over last year, which is promising. But fully 77% are holding steady, and though we didn't ask, they are in a wait and see mode.

However, to accommodate those increasing business expenses, at least some will undertake new tasks to increase their overall income. 7% are going to start dealing with the increasing demand for pollination colonies. 23% will sell nucs or full hives next year, certainly an increasing trend, while 15% are going to simply make more honey to make more money. However, 68% are going to hold steady without increasing prices, or income.

Summer was not kind in most places this year, and 61% are going to have to feed sugar this Fall, and half of those will have to feed some form of protein. Combining weak colonies is a tried and true technique and almost half, 46% will be doing some of that, while fully 70% are checking queens to make sure the colonies make it.

Two-thirds of those doing mite checks this Summer found between 0 and two mites/check, a satisfactory situation. 10%, however, were finding five or more, which calls for action, but fully 20% don't do Summer mite checks. Time will tell on those.

But, overall, Summer colony losses weren't too bad. Last Summer 6% losses on average were reported, and this year it's only up to 7% losses. Still not earthshaking, but the trend isn't great.

	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	2.29	2.20	2.20	2.18	2.39	2.11	3.25	1.45-3.25	2.22	2.22	2.17	2.19
55 Gal. Drum, Ambr	2.13	2.15	2.05	2.15	2.13	1.83	3.00	1.35-3.00	2.09	2.09	2.07	2.10
60# Light (retail)	215.86	185.00	201.67	170.95	165.00	188.15	220.00	122.74-325.00	207.85	3.46	204.69	205.03
60# Amber (retail)	214.18	185.08	200.00	168.55	214.18	183.12	226.25	119.74-325.00	205.98	3.43	207.03	203.95
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	109.95	75.30	95.20	74.00	61.20	84.00	109.95	57.60-194.40	93.90	7.83	89.46	84.58
1# 24/case	141.78	124.13	133.02	102.39	134.00	107.91	168.00	80.00-300.00	129.57	5.40	132.82	121.81
2# 12/case	140.10	92.75	116.87	88.72	111.84	104.40	140.10	79.20-246.00	117.60	4.90	115.39	110.65
12.oz. Plas. 24/cs	121.28	99.38	102.67	86.11	83.76	102.60	96.00	66.00-216.00	101.55	5.64	102.41	96.62
5# 6/case	144.69	110.25	190.50	104.62	113.16	112.60	144.69	71.50-240.00	133.62	4.45	129.43	126.22
Quarts 12/case	177.35	146.34	133.50	142.80	144.03	119.03	144.00	108.00-300.00	150.70	4.19	153.66	149.90
Pints 12/case	100.57	92.92	78.67	95.17	111.00	84.08	84.00	60.00-160.00	91.14	5.06	94.81	90.85
RETAIL SHELF PRICES												
1/2#	5.07	4.22	4.88	3.88	4.40	3.50	6.88	1.99-9.00	5.24	10.48	4.92	4.95
12 oz. Plastic	6.42	5.41	6.32	4.72	5.48	6.29	5.40	1.50-12.00	6.10	8.13	6.17	5.97
1# Glass/Plastic	9.11	7.64	7.86	6.23	7.44	6.75	8.25	3.50-17.00	7.98	7.98	7.86	7.35
2# Glass/Plastic	13.66	12.28	14.11	9.88	13.63	9.88	16.00	3.19-25.00	13.22	6.61	13.11	12.37
Pint	11.78	11.06	8.00	8.44	10.00	9.70	11.48	4.00-22.00	10.57	7.05	10.65	9.76
Quart	21.33	18.65	14.71	16.10	17.23	17.39	19.05	8.00-40.00	18.66	6.22	18.21	16.57
5# Glass/Plastic	26.34	24.60	43.00	21.50	24.23	26.70	27.65	4.00-48.00	26.68	5.34	28.18	26.62
1# Cream	10.92	8.95	10.92	8.30	7.95	8.50	9.20	6.00-18.00	9.83	9.83	9.62	9.22
1# Cut Comb	14.04	13.23	11.65	10.86	15.00	10.50	13.50	6.00-25.00	12.58	12.58	11.99	11.44
Ross Round	10.47	6.63	10.47	8.50	10.47	10.25	12.49	6.60-15.60	9.83	13.11	10.02	8.55
Wholesale Wax (Lt)	7.86	6.23	5.60	5.59	9.33	4.50	9.20	1.90-16.00	6.76	-	6.81	6.29
Wholesale Wax (Dk)	5.31	3.83	4.52	5.37	5.31	3.88	7.00	1.65-9.50	5.04	-	5.10	5.55
Pollination Fee/Col.	87.28	75.83	56.67	106.25	87.28	92.00	61.00	30.00-150.00	84.56	-	86.22	84.25

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NEXT MONTH

Welcome to NEXT MONTH, where our Honey Reporters share a line or two about what they will be doing NEXT month 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.

Region One
Wrap hives, weigh and feed with patties or dry sugar or candy boards, check and treat for mites, insulate top of hives and add moisture board, remove bear fences, shake out small clusters, mouse guards, check queens, reduce to two deeps and a medium, close screened bottoms

Region Two
Combine weak hives, check and treat for mites if needed, weigh and add sugar and protein to have 60 lbs. stores, arrange frames for food and clustering, check queens, reduce entrances, remove weak colonies, insulate top, mouse guards, close screens

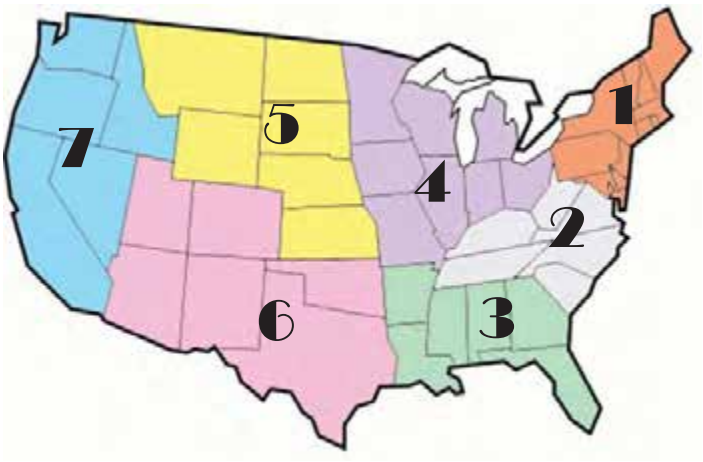
Region Three
Feed as needed, check and treat for *Varroa* if needed, entrance reducers and screens closed

Region Four
Combine weak colonies, feed if needed, make a list for next year, check and treat for mites, arrange honey and cluster frames, mouse guards, insulate, insulate above inner cover

Region Five
Arrange frames for food and clustering, insulate, feed if needed, mouse guards, move bees inside if you have building, mouse guards, mite check

Region Six
Feed if needed, clean yard, replace old woodenware, check mite loads, requeen if needed, combine weak colonies, remove dead hives from yard,

Region Seven
Feed if needed, check and treat for mites, Winter protection for wind and mice, check queens, move to Winter yards



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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

I live in Minnesota, what's the best way to overwinter, given I don't have indoor facilities, and it's tough to get to outyards once I tuck them in until March or so to check?

While it is nice to check on the bees during Winter to ease our curiosity and quench our thirst for bee to beekeeper contact, I find it really is not necessary (even in Northern states like Vermont) as long as one pays attention to three basic things. 1 - make sure the bees are healthy, which means primarily that varroa and diseases are attended to; 2 - make sure the bees have plenty of food stored for Winter, and the majority of it is located where the bees will be n Spring (above the brood nest in Langstroth and Warre hives, and at the opposite end of the brood chamber from the brood in Top Bar hives); 3 - make sure the bees stay dry by securing the inner cover, providing insulation over the inner cover, and making sure there is plenty of ventillation to vent out moisture. If I do everything right in late Summer/early Autumn, there should be no need to check the bees until March. *Ross Conrad, VT*

We had a huge study in South Dakota overwintering in Wisconsin, and we used bee cozies from Dadant with solid bottom boards and we had a pretty high overwintering success rate. We did feed them syrup up until the weather was too bad to travel, and we had scales on them so we could see if they needed intervention based on weight loss. I would suggest trying out the bee cozy and see what it does for you. *Jessica Louque, NC*

Your mite check in September will more or less determine if they will make it. If you had more than five or six in that test, my opinion is that this is a dead colony, but it doesn't know it yet. Russians and some others may get by, which is why we have them, but most are already dead. If lower though, enough good food, all of the time for every bee in the bunch all Winter long. If you don't have 100 pounds of honey along the sides and above the brood nest today, and about 10 frames of pollen, eight minimum it's going to be tough. Of course you have to have enough bees, too. Enough to cover those 10 frames of pollen. But then, some races – carniolans and certainly Russians and such, do fine with fewer bees, which is why you got them in the first place,right? Ventilation so you don't get moisture buildup, and protection from wind and predators. Healthy, well fed and protected bees should do OK, no matter where they are. Short answer, long problem, but it's a start. *Kim Flottum, OH*

Question 2 (these two must have been talking to each other)

I live in northern Alabama, and have bees in the backyard and a couple of other places not far from here. I can get to them almost anytime I want, but I don't want to have to check them every week. What's the best I can do to get them through Winter, without working myself to death all Winter?

Two things we do before the Winter sets in; make sure mite loads are low and food stores are high. We only check our colonies a few times over the Winter to make sure the honey is positioned close to the cluster or to see if the bees have exhausted their food. Also, for every frame of bees and brood there needs to be 1½ frames of honey going into Winter. *Jennifer Berry, GA*

Depending on how many hives you have, I'd suggest putting a scale on them. Broodminder has some pretty good scales and they're not overly expensive or difficult to use. You can monitor weight loss to see if they need beekeeper intervention. As a precursor to winter, make sure you have treated for varroa effectively and monitored the mite loads, as well as ensuring a good food supply in the hive. *Jessica Louque, NC*

Give yourself a break! How about once a month? You could do a few mite checks and investigate hives that seem to be struggling, relative to their neighbors. Other than that, I'd leave them alone until Spring. *Ed Colby, CO (we apologize for misspelling Ed's last name in the September BEETALK article)*

Actually, see the Minnesota answer above. Mite levels near zero, enough food (I'd suggest 50 pounds here, not 100) and pollen, with ventilation, protection from predators and room to expand in early Spring. Again, short answer, long question. *Kim Flottum, OH*

Question 3

A beekeeper in the southern part of my state (Ohio) wants to take my 24 colonies out to California next January. He says this is what he does . . .

- Feed and check until almonds (broker crew)
- Check in almonds (broker does)
- Move to holding yard after almonds (broker does)
- Split and sell the split for $200 and divide the $$ with me (he does)
- Bring back as many colonies as he took, about the same or better strength

So he gets half the split $, and all the rental $, and I get $100 and pretty good colonies going into Minnesota Summer.

What am I missing?

Seems to me this offer should only be considered by a beekeeper who is so inexperienced that they are unable to bring their bees through the Winter themselves and even then with some reservations. I would weigh the financial gain ($100) and the promise of live colonies in Spring (that are not as strong as they should be due to being split), with the fact that far too many colonies are stolen during almond bloom and those that aren't get a healthy exposure to the toxic pesticide cocktails used by the almond growers. I think the broker is getting the better end of the deal as they don't have to do all the work of investing in nucs/packages, equipment and the time to raise a hive so it is ready to be prepared for almond pollination in the first place. Keep taking the broker up on this offer and you will never learn to overwinter your bees successfully. *Ross Conrad, VT*

I wouldn't do it if it were my bees for a few reasons. Not everyone will agree with me, but between a nutritional deficit, bee thieves, and someone else controlling my hives, it would drive me crazy. Not to mention not knowing what your bees are exposed to – and not just pesticides. Almond groves can be like a freaking unvaccinated kindergarten classroom spreading disease, bad strains of bees, pests, and *Varroa*. It sounds like you want to go for it, but just have a contingency plan – can you afford to replace your hives if you don't get them back, or they don't come back like you expect? Will you have the records to prove the condition of your colonies upon exit? *Varroa* levels, small hive beetles, disease, queen description, temperament, colony provisions – how can you protect yourself if you get back bees you didn't expect. Contact your apiary inspector at the least and get a written inspection report. *Jessica Louque, NC*

This proposal isn't all bad, and with only 24 colonies, you don't have much (any!) bargaining power. You send 24 hives to the Land of Mites and Honey, and you get 24 back. Hopefully they all grade out prior to shipment to CA. Your Winter losses become somebody else's problem, and you get to take some time off from beekeeping. And you get a check. Nice! You do lose half of your drawn-frames and woodenware when your partner sells those splits, and comb turns to gold when you run out. On the other hand, you won't have to make Spring splits yourself, to head off swarming and replace your Winter losses.

The devil's always in the details. You're sending your bees halfway across the country with a trusted friend? A stranger? What's his reputation? And who's this broker? Will he go to bat for you when the grower starts spraying fungicides on blooming almonds in broad daylight? You'll be in the hot zone, so what about mite control? What if somebody steals your bees? Or your partner's? Are you in this together, or separately?

This might work for you, but do it with eyes wide open. *Ed Colby, CO*

Answer to Question 3 on page 29 of the September, 2019 issue – The "beehaver" should set some higher standards. To have that mite count is a result of abject ignorance, irresponsibility, laziness, or all three. If you are not going to be a steward of the bees then give/sell them to someone that brags about controlling pests rather than the pounds of honey extracted. The count is proof to me that nothing has been done to control *Varroa*. I get infuriated when I read/see this poor example of "keeping" bees. Sell some of the honey, study *Varroa* mite control, and do something about the count. *Roger Montague, NC*

"For, lo, the Winter is past, the rain is over and gone; the flowers appear on the earth; the time of the singing of birds is come, and the voice of the turtle is heard in the land."
– Song of Solomon 2:12

THE STORY OF A.I. ROOT

Wintering Bees

A.I. **Root**

In the year 1866 I had a light colony, or rather nucleus that I put into the cellar. This cellar was so arranged as to keep an even temperature of about 40°. We gave only one comb of sealed honey early in December, at which time the bees were almost entirely destitute. Nearly everyday I tapped on the side of the hive, expecting the bees to be out of honey long before spring but, to my surprise, they answered promptly every time until the middle of March, when I set them out of the cellar. I was agreeably surprised to find not more than 20 dead bees on the bottom-board, though other colonies had lost two or three quarts and on taking out the frame of honey supplied, I found what I would have supposed an impossibility – nearly all of it remained. These bees must have lived more than three months on less than three pounds of honey. By placing my ear against the hive in the cellar I could hear scarcely a sound unless the hive had been jarred in some way.

What I Learned About Wintering

By 1874 I had learned that, if a 10-frame colony in the fall had seven combs of brood and bees enough to cover them nicely, it would not be too strong the first day of September. If the brood-combs all bulged above the brood with sealed stores and the other combs were full and heavy with pollen and sealed store, there would be an ample supply. Uncapped, watery-looking honey I did not consider desirable. I favored sugar syrup in place of honey, fed to the bees principally during the month of August. During this month I also fed enough to keep up brood-rearing briskly, moving the combs about but little and leaving each colony all the pollen gathered and just in the position the bees placed it.

Wintering Bees on Candy

I once tried some home-made candy for wintering bees. I put it over the cluster, but it soon got soft and sticky and finally ran down on the bees and daubed them up in such a way that I never wanted to see any more candy and I suppose the bees felt about the same.

In October, 1875, I was away from home for a couple of weeks and when I returned my feeding was rather behind. It was about the middle of October and I was so afraid that the bees would not get the syrup nicely sealed that I stopped feeding and sent a barrel of "Coffee A" sugar to the confectioners to have it made it into nice hard candy. I proposed to give several good strong colonies about half their rations in candy laid under the quilt on top of the frames.

All unoccupied combs were removed and piled up where they would be handy the next Spring. I was rather disappointed to find that my strong colonies when thus condensed did not cover more than four to seven combs, yet when these were well filled with stores I thought the supply ample. If I had any doubt I laid sticks of candy on top of the frames under the quilt. The sticks were 10" by ½" by ½". I gave one colony nothing but empty combs and candy. The candy was very hard and brittle and therefore I did not think it unwholesome. It cost about 12¢ a pound.

Preparing Bees for Winter

By November 1, 1875, I had reduced my bees from 108 to 90 colonies and I believed they were all supplied with Winter stores. But after weighting them I was much disappointed in finding that I dared risk very few of them, especially since they were so much stronger than usual. There was no help for it and since I dared not feed syrup so late, I gave them bricks of candy. There is one very great advantage in favor of the candy: it can be given at any time and under any circumstances without the least danger of robbing.

I untied 18 colonies by simply lifting bees, combs and all into the hive desired, and did not see a single queen attacked. I was agreeably surprised to find that where the hives were no further apart than six feet from the center to center, any one could be united with its neighbor and the hive itself removed at once when the bees were flying, for they would all find the hive to which the colony had been united by hearing their comrades call, so that not a single bee would return to the old stand and be lost.

Where the distance was greater than six feet I shook all the bees off the combs in a heap before the entrance, removing the old hive entirely. The bees on the wing gathered at once at the hive where the commotion was, attracted by the loud humming of their companions and all went in like a new swarm.

My colonies were not all in the condition I could wish, after all. Those in the house apiary had too few bees, all being new colonies made late in the season. The others had plenty of bees, but on this very account were found short of stores in October

and that is the reason I gave the candy. The bees stored this in the combs at a very fair rate during warm weather, but when it became cool the candy was taken very slowly. Since they could not finish it entirely, I put them away, candy and all.

Importance of Housing Bees Early

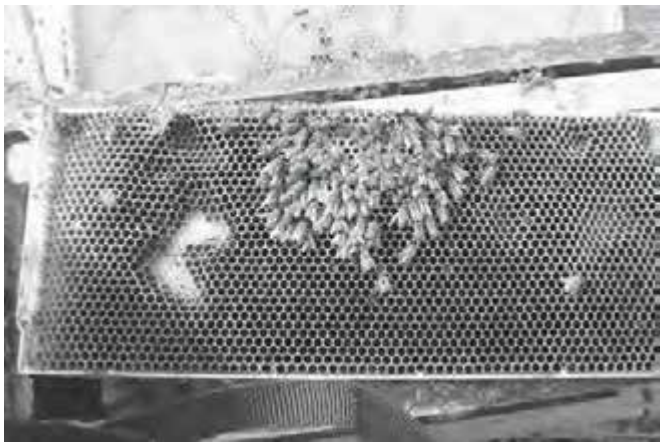
I feel sure that dampness in some form or other had much to do with my losses in wintering in the early years and by the Fall of 1875 I was advising that all colonies be fixed, whatever the plan might be, during dry weather. So far as I can recall, my losses occurred when I had housed the bees during cold wet weather. Indeed, in the Fall of 1873 they were housed during a snow storm. I had waited so long that I dared not wait any longer, so in they went. Perhaps the manure heaped around the hives that I was trying at the time contributed to keep the hives damp during the entire Spring also. In the Fall of 1874 I put the bees in the bee-house on the 3rd of November, at least two weeks earlier then ever before. They were put in as dry as a chip, for it was during very dry weather when it was so warm that I feared the consequences; yet they seemed to go into that desirable dormant state at once. As I was all taken up with the glass house, the majority of the colonies were almost entirely neglected (?) until March 15th: and yet, strange to say, they seemed almost precisely as they were the day they were put away, and they made as fine progress as one could wish until the freeze during the April following.

A strong colony of bees will dry out a damp hive or a set of damp moldy combs. In fact, one might drench the bees with water and they would soon be all right again if they were given only half a chance. The small colony, on the other hand, can do nothing and will remain damp and cold until they perish. If a colony has a cluster only on one side on combs containing watery honey or combs that look blue and moldy, it is pretty safe to assume that the bees will not Winter well and that the sugar that was fed, the time, the bees, and the queen will all be lost. The remedy is to unite colonies until they are strong the moth millers, ants and all insect enemies enough to be able to drive out not only mites, but also dampness and the wintering malady as well.

Wintering on Candy and Flour

In 1877 I made some experiments in giving bees small amounts of candy and discovered that under this treatment the combs soon filled up and everything began to prosper. I began wondering if there were not some way o giving them a big lot at one time. Candy bricks could be put above the frames, but after these had been consumed the bees were quite apt to build combs above the frames. Putting a heavy frame of sealed honey into a hive seemed the most satisfactory way and therefore I had a cake of candy made that would just fit inside a Langstroth frame. The bees at once filled their combs as if it were clover time and yet it was done so quietly that not a robber even smelled any feeding going on. One such frame weighted seven pounds and I felt that a pair of them would Winter a large colony even without a drop of stores. Then it could be packed as snugly as desired under chaff cushions. After the candy was all gone the bees could build comb in the frame that contained it.

While feeding this candy many eggs were laid, but as the bees were entirely out of pollen no larvae made their appearance. So I had some more slabs of candy made the same as before, but with one part of flour to ten of sugar. This looked all right, so I made another one one-fourth flour. The bees ate this in preference to the pure sugar and soon had a nice lot of brood.



Wool Cushions for Winter

I often thought of hair, fur, feathers, etc, for cushions and did experiment in the Winter of 1876 with a colony done up in wool; but the bees got tangled in it in such a way that I desisted. A friend of mine used cushions made of wool, I believe, with good results, although they were rather more expensive than chaff or cotton. I decided that the covering for all these kind of cushions would have to be made of duck, for any other fabric would soon be gnawed through. Many of my friends wasted money in trying different kinds of woolen cloth, but everything I tried like this was sooner or later eaten full of holes and spoiled by the bees, except hard twisted cotton such as I have mentioned.

In 1876-77 I wintered less than a quart of bees in the house apiary and had the little colony increasing almost all winter long by help of the chaff cushions.

Frames on End in Winter

In the February number, 1883, a correspondent suggested standing the regular Langstroth frames on end to two hive bodies, so as to have room for packing material. This was an old idea even at the time, first mentioned I believe by Mr. Quinby, also described in *Gleanings* in the early days. I do not know that I ever had a report from anyone who had tried the plan, however. I suggested the use of only three combs a little farther apart than in the Summer. These would easily hold all the bees needed for Winter, but of course for an extremely large colony six combs would be used instead of three.

Overwintering In A Bee House

My first building for bees was a Winter repository that I built in the Fall of 1869. The walls were packed with sawdust and there was a complete ventilating scheme to provide fresh air.

I had a stone foundation laid, 10x14 feet with two rows of brick on top, with holes in opposite sides of the wall, made by omitting two bricks, to allow ventilation. Sawdust was packed under the floor and in the walls. The walls were made of 10-inch studding, to permit 10 inches of sawdust packing. We put a double window in one end and a double door in the other. The ventilator through the roof was seven inches in diameter and extended just below the ceiling inside. The lower ventilator through the floor was simply a square box seven inches across and covered with wire-cloth to exclude mice. A very small stove was ample to keep the room comfortable.

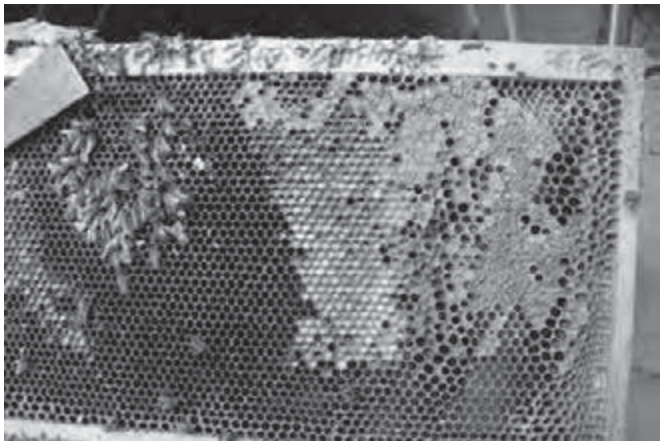
Bees Hum When Too Cold

As early as November of that year I moved in one rather

weak colony to test the house. One quite cold night outdoors before I moved them in, the bees were making a very loud humming, such as weak colonies always make when they are very cold. In two hours after carrying them in they were so still that not a sound was noticeable unless that hive was disturbed.

Many had said that five inches of sawdust would be plenty, but in a building in which no help is expected from the sun I thought we should find fully as much trouble in keeping off the effects of the sun as in guarding against frost; and even though the room were kept as dark as midnight, I did not expect the bees to be as quiet as they should be unless the temperature were never higher than 40 or 45°. Whenever we were not able to maintain such a temperature, I expected to set the bees outdoors.

By the 20th of November I had put my 46 colonies inside the bee-house. On account of the bad weather I am sure that it would have been better if I had put them in about a month earlier. The day we put them in happened to be quite cold and as I did not want the caps on I took them off and left them on the Summer stands. Most of the colonies behaved quite well, although the hybrids made up their minds that they would stay where they were. They had been extremely cross all the season and positively objected to any assistance whatsoever. From one of them I removed the cover, thinking that the freezing air would drive the bees down among the combs; but after leaving them thus until all the rest had been taken in I decided they would have to be treated like refractory children and put in by main strength.



Hybrid Bees Refuse to Become Quiet

I am not in the habit of being intimidated by bees; but the battle array on top of the frames was rather fierce looking and when I approached, the bees came more than half way to meet me in an onslaught much like that of a young hailstorm. Smoke was of no use, as they seemed to be all out of the hive before I got within 10 feet; yet I tried it and think that for almost the only time the fumes of tobacco seemed to have no terrors for the bees. I might smoke them until they lay on their backs, but the moment I stopped blowing they pitched in with fresh vigor until I finally, when I lost all patience and carried the hive in, letting the bees come along or stay behind, as they liked, I had about the fairest exhibition of real hybrid bee fury that perhaps had even been displayed. They buried themselves in my shoes, trousers, coat, vest, hair, collar, waistband and everywhere else. None of them got lost as they were so busily engaged in bestowing their whole attention on my precious self. Thus we all got into the bee-house, but instead of taking their places orderly in a row, as I had planned they should and very particularly desired that they should just then, they pitched in more furiously than ever until I began to think I would rather take a back seat and be a spectator a while.

Well, these bees raised such a howling that I really began to fear that the bee-house was going to enjoy anything but quietness and the other colonies as well seemed to be rapidly getting demoralized. I left the door open on cold nights until the thermometer went down almost to freezing, still the bees persisted in promenading constantly on the tops of the frames, scolding away worse than a lot of sitting hens.

Elisha Gallup, I noticed was advising more ventilation for bees in Winter. As I had covers off of the worst colonies and the entrances all open, I did not know any better way to ventilate unless I put the hives in the middle of a 10-acre lot with the bars down.

Finally my business became so pressing at the approach of the holidays that I had no time to see to the bees. After they had been neglected about a week I was surprised to find them quite orderly, although the cross rascals did boil over the top as soon as I showed my face. I then went away and shut them up in total darkness. After this I slipped in quietly about once a week and for the next four weeks the thermometer did not vary one degree from 40°, although the weather outside was cold and warm alternately. One it was so warm for several days that I could hardly understand how it could be so much colder inside. I do not think the sun produced any effect at all upon the interior. The bees in most of the hives behaved just as Mr. Gallup had described in his writings. Were it not for their bright color and their moving when touched I might have thought them dead.

The 46 colonies of bees all wintered safely in the bee-house. On March 10th we put them on their summer stands, nearly as heavy as when they were put in. Some tried to persuade me that they would be better if left in a little longer, but I thought they were better out of doors if properly protected and cared for.

Reviving a Starving Colony

We came very near having 45 colonies instead of 46, for after removing them from the bee-house on march 10th, we had some of the coldest weather of the whole Winter – two degrees below zero. It was with a feeling of nervousness that I went around and gently tapped on each hive. Those that I feared most I tried first, of course; but when they all answered promptly "All right," I began to breathe freely. However my hopes went down to zero and no mistake, on finding that one of the heavy hives, when rapped repeatedly, gave no response. It was indeed too true. I grasped the hive and rushed madly for the kitchen stove. With breathless sorrow I hung over that little domicile which only the night before was the happy home of peace and plenty, but where all was now still. No little yellow bodies moved so softly and quietly about, but all was cold and frostily in death.

On one side of the hive there was plenty of sealed honey, but the bees had eaten along the other side where the relentless zero weather found them consuming the last on that side. I warmed them and re-warmed them, but not a movement until, after an hour or two, a few stirred a little, but that was all. I began to think I would have to give up, as I had tried the same thing the year before. My presence, too, was beginning to interfere with the preparations of the noonday meal. However, I could not give up yet. I visited the hive again, but this time with less determination than before and slowly walked toward the bee-house. I built a fire in the little stove, I opened the hive,

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brushed the bees into a large pan (all I could get out of the cells) and warmed and warmed them. It was no use – only a feeble movement occasionally. At length the sun came out through the frozen air into the single bee-house window. I put the pan on the window-sill to help in looking for the queen I had not yet found. Was it my imagination or was the sun really reviving them? Yes, they were certainly coming to. After sprinkling them with honey and water they got brisk space and on standing a comb up in the pan they crawled on it as fast as they revived and those in the cells towards the sun began to wriggle out. Before night I had the whole colony back in their hive; and a month later the pretty yellow queen was enlarging the circle of worker brood with all the matronly pride imaginable. So you see I came out ahead in the race of life and death and had the whole 46 colonies all right.

The 'House' Apiary

In the Summer of 1875 I became interested in a new project and for fear it might be only another "glass house" experiment I issued a supplement to *Gleanings*, feeling that the pages of the regular number should be occupied only with matter of known value.

Extracting honey is a laborious operation and a great portion of the labor involved is the necessity of carrying the combs from the hive to the extractor and back again. In order to have my 48 colonies located within a couple of yards of the extractor I determined on a double-walled, sawdust-packed, eight-sided building with three colonies to a side and with entrances through the double wall by means of a two-inch tube. This would provide space for 24 colonies with entrances about two feet apart. Four feet above the floor I provided another tier of hives, thus making the 48 colonies in all. I proposed making the three hives all in one with only thin boards to divide the three colonies and as all would be well protected from the weather a thin cloth covering would be ample protection. I planned to have the whole inside of the room warm in winter by retaining the animal heat from so many colonies closely packed.

When time to extract my plan was simply to take out the combs and hand them to an assistant at the extractor after the bees were brushed back into the hive. Any bees taking wing would soon fly out of the two large doors, one on each side.

By June 28, 1875, I had my unfortunate glass house all removed and in its place the octagon house. It was a two-story building that was originally made to grind grain with a windmill for motive power.

By July 14th my "house apiary" was nearly ready for the bees. I decided to put but 36 hives in the room. As explained, there were eight sides, each six feet wide and seven feet high. The east and west sides were occupied by large double doors and the others contained six hives each, three on the floor and three on a 20-inch shelf three feet from the floor.

By July 28th 15 colonies had been placed in the house apiary and more were being put in as fast as a queen was found emerged. The first two queens (which had emerged on the 20th) were laying by the 28th and although I took no pains at all to make the entrances unlike either by paint or otherwise, there was no confusion. I took particular pains to see a queen take her flight. When she came back while she took a look into the entrances on either side, she seemed to say, "That is not my house, nor that one, but this one is," and then she glided into her own two-inch auger hole.

The walls were four inches thick and I worried a little about the bees having to crawl the distance, but I found they swept right in and alighted with their huge loads of pollen directly on the outside combs, the combs running parallel with the side of the building. I was astonished to find that bees were much quieter in a darkened room. When the doors were closed the room was as dark as ink.

When shaking the bees from the combs they generally crawled back into their own hive at once, but I had a few heavy colonies that started in a body and marched all over the walls and ceiling. However, if no other hive was open they almost immediately went back again when the room was darkened.

Notwithstanding the apparent success of the house apiary, I advised no one to invest in a similar building until I had had an opportunity of trying it at least a year, for there was a chance that it might turn out like the glass house and I had forgotten the money that that cost.

The First Winter in the House Apiary

In December the mice got into the house apiary and I at once proceeded to make some mouse-guards out of pieces of galvanized sheet iron 2¼" square, large enough to cover the 2" auger hole entrances to the hives. In the sheet iron I punched two 5/16" holes so close together that they cut each other, making an opening large enough for one bee. A galvanized tack held these mouse-guards in place.

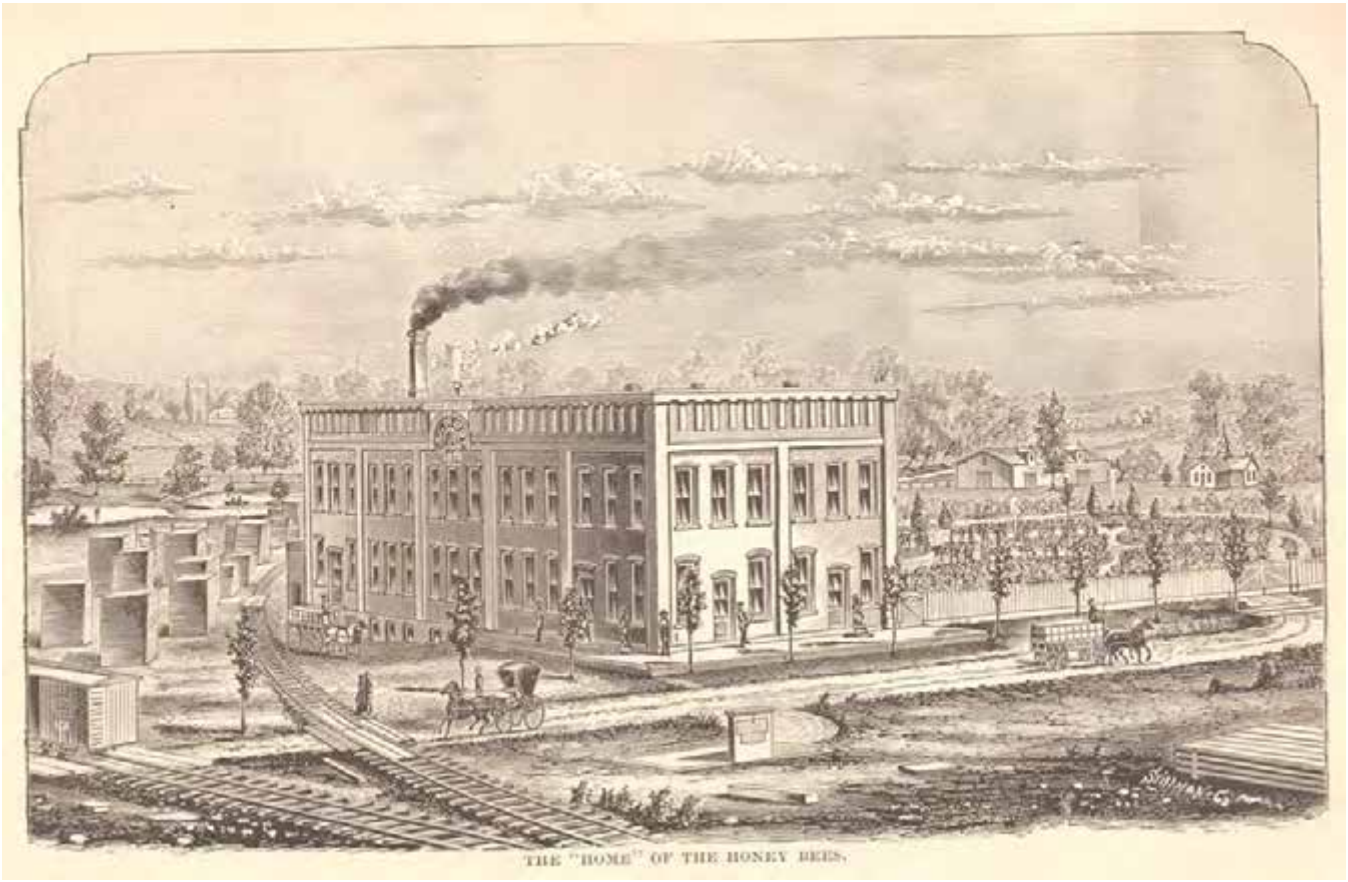
In the old bee-house the bees were in the habit of getting out of their hives on a very warm day; but those wintered in the house apiary, having entrances to the outside, seemed perfectly contented so far as I could see. After two weeks' time there were a few dead bees brought out of the house apiary, perhaps a dozen per colony on the average, but these undoubtedly died of old age and were not an abnormal number of that length of time.

On February 12, 1876, bees were working on meal out of doors. I think it was the first time I ever fed meal in February. The sun shone very hot on the covers of the hives.

One colony I found dead in the house apiary. The bees died of starvation, although there were combs containing several pounds each at the other side of the hive. It was quite a good-sized colony, but the bees were clustered on new combs and the hive stood right close to the door, which did not fit very tight. If the heavy combs had been placed next to the cluster or if the space had been contracted so that it would just hold the bees, no doubt I would not have lost the colony.

Trouble with the House Apiary

In the Spring of 1876 I noticed the fashion young bees had of pouring out of the top of the hive when it was open for examination. This did no harm, except that when one was through working there was a shower of bees determined to return to their own hive and to the very spot they came from. Even after they were all driven away they would sometimes hang about the door for an hour or two and it is doubtful



THE "HOME" OF THE HONEY BEES.

whether they all regained their own hives if the entrances happened to be at a distance from the doorway. In case of hives out of doors it makes no difference where they get out, they always find their own entrance.

By May, 1876, seven colonies had died in the house apiary, five on the north and two on the south side. None of these colonies were very strong in bees except those that starved. In the house apiary it seemed such an easy matter to feed candy or sugar at any time that I was careless about the amount of stores, thinking that I could give more at any time in a few minutes.

When the house apiary was first built it was a novelty and it was a pleasure to have everything nice and exact. After a while it got to be something of an "old story" and then in stepped a besetting sin – a disposition to prefer working at some new thing. I was beginning to feel that I would like very well to try something else, but I realized that if I was really unable to stick to what I then had on hand and do that well, I should deserve to lose the confidence and patronage of my friends and readers.

There were a good many bees on the floor of the house apiary and to hear them snapping under my feet was enough to make me nervous, when I had been trying so hard to keep the floor clean. To be sure, the bees had no kind of business on the floor any way, but that Spring they had taken the peculiar fancy of crowding out under the edges of the cloth coverings of the hives rather than going out by the entrance.

Although I had put sealed honey close to the cluster in every colony running short of stores in April, I discovered that of the 36 hives only eighteen contained live bees. Many of the colonies had starved with sealed honey plainly visible through the glass division-board and a few had really used particle in the hive and then lay dead in great heaps that seemed to say to me "Why did you, with so much care and pains, bring us into existence only to let us die in such a shameful way just as the gentle April breezes were beginning to call us forth to activity?" The colonies had perhaps reared more brood than those out of doors, as there were great heaps of dead bees where there was but a small colony last fall. Those out of doors did not starve because they did not rear brood and exhaust their stores.

On May 9th the bees in the house apiary were dwindling so rapidly that I feared none would be left. Most of the colonies outside were building up, but a few of the weakest were going down with the well-known Spring dwindling.

By May 18th conditions were much improved again. My whole apiary by dwindling had been reduced to 52 colonies and then the weather changed and colonies with only a half-teacupful of bees began to build up. The house apiary, too, caught inspiration caused by how honey, plenty of new pollen and the soft balmy air, until bee culture seemed the very easiest thing in the world. BC

A Closer Look

HYGIENIC BEHAVIOR

Clarence **Collison**

Hygienic bees uncap and remove diseased and parasitized brood from the nest.

Honey bee hygienic behavior is a mechanism of disease resistance and a mode of defense against the parasitic mite *Varroa destructor* (Anderson and Trueman). Hygienic bees uncap and remove diseased and parasitized brood from the nest. The propagation of colonies that demonstrate resistance to chalkbrood and American foulbrood and that remove pupae infested by *Varroa* mites is becoming increasingly important.

Spivak and Downey (1998) "evaluated two commonly used field assays used to screen colonies for hygienic behavior: the freeze-killed brood and the pierced brood assays. Both involve determining the time required for worker bees to remove dead capped brood from a section of comb. Colonies in the experiment displayed a wide range of removal rates and were grouped as hygienic, non-hygienic, or intermediate. The results of experiments one and two indicated that neither the age nor the source of the frozen brood had a significant effect on the removal rate by hygienic colonies (i.e., those colonies that consistently uncapped and removed freeze-killed brood within 48 hours). In experiment three, only a weak correlation was found between the removal of young freeze-killed and pierced pupae, but a significant correlation existed between the removal of pre-eclosion freeze-killed and pierced pupae. Experiment four examined cues that elicit removal behavior by hygienic and non-hygienic colonies. When pupae were pierced with an insect pin through the base of the cell (without piercing the wax cell capping), there was no difference in the number of pupae removed by the hygienic and non-hygienic colonies. On average, 30% of all pierced pupae survived the treatment, which considerably diminished the accuracy and reproducibility of the test. When pupae were treated with hemolymph extracted from either a live or freeze-killed pupa, there was also no difference in the rate of removal by hygienic and non-hygienic colonies.

These results indicate that bees from non-hygienic lines can be induced to express hygienic behavior only if a sufficiently strong stimulus is present. Both hygienic and non-hygienic colonies removed significantly more pupae treated with hemolymph from a dead pupa than hemolymph from a live pupae, indicating that the cue that stimulates removal behavior is stronger in dead pupae. It is concluded that the freeze-killed brood assay is the most conservative and reliable screening procedure for hygienic behavior. The following procedures are recommended: Randomly selected comb sections (5 by 6 cm each) of capped brood should be cut from 1 healthy colony, frozen, and introduced into the test colonies. The assay should be repeated at least twice. Only colonies that remove >95% of freeze-killed brood within 48 hours in both tests should be considered hygienic. When developing hygienic breeder stock, the hygienic colonies should be challenged with the American foulbrood or chalkbrood pathogen to ensure resistance."

"Honey bee colonies, selected for hygienic behavior on the basis of a freeze-killed brood assay, demonstrated resistance to American foulbrood disease (Spivak and Reuter 2001). Over two Summers in 1998 and 1999, 18 hygienic and 18 non-hygienic colonies containing instrumentally inseminated queens were challenged with comb sections containing spores of the bacterium *Paenibacillus larvae* subsp. *larvae* that cause the disease. The strain of bacterium was demonstrated to be resistant to oxytetracycline antibiotic. Seven (39%) hygienic colonies developed clinical symptoms of the disease but five of these recovered (had no visible symptoms) leaving two colonies (11%) with clinical symptoms. In contrast, 100% of the non-hygienic colonies that were challenged developed clinical symptoms, and only one recovered. All non-hygienic colonies had symptoms of naturally occurring chalkbrood disease (*Ascosphaera apis*) throughout both Summers. In contrast 33% of the hygienic colonies developed clinical symptoms of chalkbrood after they were challenged with American foulbrood, but all recovered. The diseased non-hygienic colonies produced significantly less honey than the hygienic colonies."

"Hygienic behavior in honey bees is a heritable trait of individual workers that confers colony-level resistance against various brood diseases. Hygienic workers

The bees performing hygienic behavior were middle-aged bees, younger than foragers.

detect and remove dead or diseased brood from sealed cells. However, this behavior is quite rare, with only approximately 10% of unselected colonies showing high levels of hygiene. Beekeepers can potentially increase this by screening colonies for hygiene and breeding from the best. However, the level of hygiene expressed by a colony is variable, which poses a challenge to colony selection. Bigio et al. (2013) systematically varied two factors thought to be of importance in influencing hygiene levels, "nectar" availability, by feeding or not feeding sucrose syrup, and brood amount, by adding or removing brood, to determine what effect they had on hygienic behavior. They tested 19 colonies repeatedly over a four-month period using the freeze-killed brood assay, a standard technique to quantify hygienic behavior. Two days after freeze-killed brood treatment, their colonies showed a wide range of brood removal levels with colony means ranging from 31.7 ± 22.5 to 93 ± 6.9 (mean % ± SD). Neither the food nor the brood manipulation had an effect on hygiene levels. Colony size and time of year were also non-significant. The only significant effect was a three-way interaction between syrup availability, amount of brood, and time of the year, resulting in reduced hygienic behavior early in the season (spring), in colonies with added brood that were not fed sucrose syrup. Overall, these results suggest that hygienic behavior is not greatly affected by environmental conditions typical of real-life beekeeping, and that screening of colonies can be done anytime without special regard to nectar conditions or brood levels."

Arathi et al. (2003) "observed bees performing hygienic behavior to determine their age at performance of the behavior and to describe their behavioral repertoire. The bees performing hygienic behavior were middle-aged bees (15-20 days old), younger than foragers. In the colonies where the behaviors of individual bees were observed, all bees performing the hygienic behavior were seen to exhibit both the components, though at different frequencies. One behavioral class performed the task of uncapping cells at higher frequencies than the task of removing cell contents, while another class performed both tasks to the same extent. While these two classes had higher frequencies of the tasks comprising the hygienic behavior but lower frequencies of other common behaviors in their repertoire, a third class of bees included those that performed all behaviors in their repertoire at similar frequencies. There was no difference in the ages of the bees in these three behavioral classes. These results suggest that there is no evidence of task partitioning among bee performing hygienic behavior. The segregation observed could, however, be based on their response thresholds to the stimulus and/or on their ability to discriminate the various cues emanating from the dead brood."

"Social insects that live in large colonies are vulnerable to disease transmission due to relatively high genetic relatedness among individuals and high rates of contact within and across generations. While individual insects rely on innate immune responses, groups of individuals also have evolved social immunity. Hygienic behavior, in which individual honey bees detect chemical stimuli from diseased larvae and subsequently remove the diseased brood from the nest, is one type of social immunity that reduces pathogen transmission. Three volatile compounds, collected from larvae infected with the fungal pathogen *Ascosphaera apis* and detected by adult honey bees, were identified by coupled gas chromatography-electroantennographic detection and gas chromatography-mass spectrometry. These three compounds, phenethyl acetate, 2-phenylethanol, and benzyl alcohol, were present in volatile collections from infected larvae but were absent from collections from healthy larvae. Two field bioassays revealed that one of the compounds, phenethyl acetate is a key compound associated with *Ascosphaera apis*-infected larvae that induces hygienic behavior (Swanson et al. 2009)."

"Hygienic behavior is likely mediated by olfactory

cues. Because the neuromodulator octopamine (OA) plays a pivotal role in olfactory-based behaviors of honey bees, Spivak et al. (2003) examined whether bees bred for hygienic and nonhygienic behavior differed with regard to their OA expression and physiology. They compared the staining intensity of octopamine-immunoreactive (OA-ir) neurons in the deutocerebral region of the brain, medial to the antennal lobes, between hygienic and nonhygienic bees (based on genotype and phenotype). They also tested how the olfactory responses of the two lines, based on electroantennograms (EAGs), were affected by oral administration of OA and of epinastine, a highly specific OA antagonist. Their results revealed that bees expressing hygienic behavior (irrespective of genotype) possessed OA-ir neurons that exhibited more intense labeling than same-aged bees not performing the behavior. In bees bred for nonhygienic behavior, OA significantly increased the EAG response to low concentrations of diseased brood odor. Conversely, in bees bred for hygienic behavior, epinastine significantly reduced the magnitude of the EAG response, a reduction not observed in nonhygienic bees. Their results provide two lines of evidence that OA has the potential to facilitate the detection and response of honey bees to diseased brood."

Bees bred for hygienic behavior exhibit an increased olfactory sensitivity to odors of diseased brood, which is most likely differentially enhanced in the hygienic line by the modulatory effects of octopamine (OA), a noradrenaline-like neuromodulator. Goode et al. (2006) examined whether the hygienic behavioral state is linked to other behavioral activities known to be modulated by OA. They specifically asked if, during learning trials, bees from hygienic colonies discriminate better between odors of diseased and healthy brood because of differences in sucrose (reward) response thresholds. This determination had to be tested because sucrose response thresholds are susceptible to OA modulation and may have influenced the honey bee's association of the conditioned stimulus (odor) with the unconditioned stimulus (i.e., the sucrose reward). Because the onset of first foraging is also modulated by OA, they also examined whether bees from hygienic colonies differentially forage at an earlier age compared to bees from non-hygienic colonies. Their study revealed that one-day- and 15- to 20-day-old bees from the hygienic line do not have lower sucrose response thresholds compared to bees from the non-hygienic lines. In addition, hygienic bees did not forage at an earlier age or forage preferentially for pollen as compared to non-hygienic bees. These results support the idea that OA does not function in honey bees simply to enhance the detection of all chemical cues non-selectively or control related behaviors regardless of their environmental milieu. Their results indicate that the behavioral profile of the hygienic bee is sculpted by multiple factors including genetic, neural, social and environmental systems."

"While much hygienic behavior-related research has focused on enhanced adult honey bee olfaction, less attention has been paid to the olfactory signals that originate inside the brood cell, triggering hygienic removal. Wagoner et al. (2018) hypothesized that selection for hygienic behavior in honey bees has influenced brood signaling, predicting that: 1) in a common social environment, removal rates differ among brood with different selective breeding histories, and 2) the removal rates of brood positively correlate to the hygiene level of the brood's colony of origin. To test these predictions, they cross-fostered brood subjected to control, wound, or *Varroa* treatment in unselected (UNS), Minnesota Hygienic (HYG) and Varroa-Sensitive Hygienic (VSH) colonies, and monitored individual brood cells for hygienic removal. Results confirmed both predictions, as brood from hygienic colonies was more likely to be removed than brood from UNS colonies, regardless of where the brood was fostered. These findings suggest that hygiene-related brood signals complement previously identified characteristics of hygienic adults, constituting an important mechanism of social immunity in honey bees. Thus, selective breeding for honey bee hygienic behavior may be improved through the utilization of field assays containing compounds related to larval signaling.

McAfee et al. (2018) "found that hygienic brood-removal behavior is triggered by two odorants- ß-ocimene and oleic acid- which are released from brood upon freeze-killing. ß-ocimene is a co-opted pheromone that normally signals larval food-begging, whereas oleic acid is a conserved necromone (pheromone given off by dead organism) across arthropod taxa. Interestingly, the odorant blend can induce hygienic behavior more consistently than either odorant alone. They suggest that the volatile ß-ocimene flags hygienic workers' attention, while oleic acid is the death cue, triggering removal. Bees with high hygienicity detect and remove brood with these odorants faster than bees with low hygienicity, and both molecules are strong ligands (a molecule that binds to another, usually a larger molecule) for hygienic behavior-associated odorant binding proteins (OBP16 and OBP18). Odorants that induce low levels of hygienic behavior, however, are weak ligands for these OBPs. They are therefore beginning to paint a picture of the molecular mechanism behind this complex behavior, using odorants associated with freeze-killed brood as a model."

"In three experiments Wagoner et al. (2019) found evidence to support the hypothesis that stock-specific chemical brood signals are induced by *Varroa* mites and Deformed Wing Virus (DWV), and elicit hygienic responses in the honey bee. By collecting, analyzing, and running bioassays involving mite-infested and control brood extracts from three honey bee breeding stocks they: 1) found evidence that a transferrable chemical signal for hygienic behavior is present in *Varroa*-infested brood extracts, 2) identified 10 stock-specific hydrocarbons as candidates of hygienic signaling, and 3) found that two of these hydrocarbons linked to *Varroa* and DWV were also elevated in brood targeted for hygienic behavior. These findings expand our understanding of honey bee chemical communication, and facilitate the development of improved hygienic selection tools to breed honey bees with greater resistance to *Varroa* and associated pathogens." BC

While individual insects rely on innate immune responses, groups of individuals also have evolved social immunity.

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FOUND IN TRANSLATION

Island Time And Resistant Bees

Jay **Evans**, USDA Beltsville Bee Lab

Island populations of honey bees act as incubators for genetics. Bee genes mix and match with each other and resident microbes and pests in ways that mimic dozens of hard-won field experiments or closed breeding schemes. While it is not a given, hardy and disease-resistant bees can evolve in these isolated settings. With respect to bees that survive *Varroa* mites, islands such as Gotland between Sweden and Finland and Isla Fernando de Noronha, far off the coast of Brazil, have provided an environment for desirably resilient honey bee stock. More generally, closed breeding populations have the potential to form islands unto themselves. Perhaps the closest breeding analogy to island life is the so-called 'Black Box' strategy for producing survivor stock (recently reviewed by Tjeerd Blacquiere and colleagues, 2019, Darwinian black box selection for resistance to settled invasive *Varroa destructor* parasites in honey bees, 2019, Biological Invasions 21:2519–2528 **https://doi.org/10.1007/s10530-019-02001-0**). In 'Black Box' selection, thoughtful crosses are enacted and maintained with a focus on colony survivorship rather than any specific desired trait.

So, if islands provide such a clear path to resilient honey bees why aren't islands or isolated bee yards universally easy places to raise super bees (spoiler: they are not). In many cases, islands either 1) lack the genetic diversity and variants needed to make a leap in hardiness, 2) are subject to continuous admixture from outside populations, or 3) are sufficiently coddled by beekeepers so as to not pick up what might be costly or precarious genetic disease traits.

Among the many Caribbean Islands, Puerto Rico holds a distinct reservoir of resident genetics coupled with a laissez-faire attitude toward parasites and pathogens, a perfect mix for producing bees that are hardy in the face of disease. Much of the genetic diversity now found in Puerto Rican honey bees reflects an influx of New-World Africanized bees from the early 1990s. This influx has led to a unique bee population and a great opportunity to study how bee behaviors, positive and negative, evolve in response to a given environment. Proponents on the island also hope that their resident Puerto Rico honey bees have evolved into a stock that is desirable not only for Puerto Rico but perhaps for other regions with Africanized bees.

Professor Tugrul Giray and his students and collaborators at the University of Puerto Rico are actively studying the behaviors and genetics of Puerto Rican bees. Their data suggest that two things have occurred since the arrival of AHBs to the island. First, honey bee populations there tolerate *Varroa* mite parasites quite well with no help from beekeepers. Beekeeping occurs across the island in dry forests and plains as well as mountains and rain forests. While Puerto Rican bees are not subjected to long winters, they do maintain seasonality mediated by patterns of rainfall, and they thrive across the various island ecosystems. Hurricane Maria, which devastated plants, bees, and people in 2017, was followed by a resurgence of all three. It is tempting to think that an influx of AHB genes has helped Puerto Rican populations get ahead of mites.

Second, Puerto Rican honey bee populations are in the gentler range of AHB, in terms of defensive behaviors. Scientists there suggest this is a combination of an adaptation to seasonal forage availability, restricted gene flow, selective pressures from

Jay Evans with bees near Mayaquez, Puerto Rico.

Meeting participants examining honey bee colonies.

humans in the island and lack of other predators (e.g., Bert Rivera-Marchand and colleagues, 2012, Gentle Africanized bees on an oceanic island, Evolutionary Applications, 5:746–756, **doi:10.1111/j.1752-4571.2012.00252.x**). Release from predators is a common trait of islands, leading to the evolution of flightless birds and 'tame' animals, at least until humans intervened. Whatever the mechanisms, the bees of Puerto Rico, on average, have gone from typical AHB feistiness early on to a more 'simpatico' or gentle state, leading Professor Giray and his colleagues to label them gentle-AHBs, or gAHBs. They have done this rapidly, while retaining an impressive feistiness towards mites and other disease. Given the unique history of these bees, along with a desire to tease apart complex behaviors, gAHBs have been subjected to state-of-the-art genomic analyses. Arian Avalos and colleagues (A soft selective sweep during rapid evolution of gentle behaviour in an Africanized honey bee, 2017, Nature Communications 8. **doi:10.1038/s41467-017-01800-0**) worked up entire genome sequences for 30 Puerto Rican gAHBs, 30 New-World European bees and 30 New-World Africanized bees from the mainland (think '23-and-Bee'). Along with showing that Puerto Rican bees hold a signature in their genes that is unique from other populations, these researchers identified genome regions that unite the gAHB population with EHBs, possibly indicating the very traits that keep them calm. While research on the Puerto Rican honey bee population continues, the results thus far indicate that gAHBs have a mix of meaningful genetic traits from both EHB and AHB parent populations. If Puerto Rican beekeepers continue to focus on gentle traits and self-sufficiency against disease, this population seems likely to continue its path toward sustainability.

I am always happy to inflict my flawed Spanish on native speakers and was thrilled to be invited to a conference regarding the bees of Puerto Rico and their environment, sponsored by the National Science Foundation, University of Puerto Rico, the Puerto Rico Science, Technology and Research Trust, and Florida International University (prhb.cs.fiu.edu). Attended by 100 beekeepers from across the island and dozens of students and scientists, this forum provided a chance for updates on science and broad discussions about bees, disease, and beekeeping in Puerto Rico and elsewhere. It also provided a full day in the Puerto Rican countryside with bees and beekeepers (you can see from the photo, if I am with bees without gloves they can't be that defensive!).

While there is justifiable excitement over the unique blend of genes found in Puerto Rican honey bees, decisions to transport these bees to the mainland U.S. or elsewhere will be made with caution, knowing how hard it is to rewind the clock if, for any reason, things go badly. Soon, a team of individuals will begin to develop a logical framework for assessing Puerto Rican bees and their associates for their good, bad, and undetermined traits. These assessments will be carried out by specialists and eventually used to help shape a logical framework for the regulators who will have the final say.

In the meantime, there's no doubt that the bees and beekeepers of Puerto Rico are resilient and unique in many ways. Moreover, the excellent studies of behaviors, colony traits, and underlying genetics that have been carried out so far provide a framework for exploring the honey bees of Puerto Rico and other island populations, and indeed honey bee subpopulations more generally. BC

FALL Colony Management

Lloyd **Harris**

Population, Weight, Pests & Diseases – All Play A Role

Introduction: Commercial honey bee colonies are managed throughout the Spring and early Summer to produce large populous colonies to coincide with when various crops need pollinating or when flowering plants are secreting copious amount of nectar for the worker honey bees to collect and convert into honey.

Almost all honey bee colony development research conducted in western Canada has focused on how to produce these populous colonies (Nelson & Jay, 1972; Smirl & Jay, 1972 and Harris 2010). These studies have consistently demonstrated that maximum colony populations never coincide with the beginning of the honey flows in Western Canada. Instead, colonies initiated with 0.9, 1.4 or 1.8 kilograms (2, 3 or 4 pounds) package of bees steadily increase in size throughout the Summer. They attain their maximum population of approximately 55,000 bees in mid to late August after the honey flow is mostly over. Wintered colonies usually attain higher maximum populations a couple of weeks sooner than package initiated colonies. Wintered colonies frequently contain between 55,000 to 70,000 adult bees by early to mid-August.

Large colony populations are dependent on colonies being able to sustain successful brood rearing levels that approach its queen and the colony biologic potential for at least a month (ideally 36 to 48 days). However, once the major flowering plants mature in late August or early September the honey flow slows to a tickle, pollen availability dwindles and colony populations cannot be sustained.

When this occurs colonies are left with 30,000 to 40,000 bees that they are no longer need. These surplus/excess bees consume colony resources without contributing significantly to the formation of the winter colony. There is usually a rapid, steady decline in colony populations until brood rearing temporarily ceases in mid to late October (Harris 2008a, 2008b). Colony decline being regulated by the combined effects of: pollen availability (Mattila and Otis 2007) and ambient temperatures, since worker bee longevity does not change significantly until late September or mid-October (Mattila et al, 2001; Harris & Harris, unpublished). Once the population decline begins, the average colony will shrink by about 600 to 750 bees per day for the next three to four weeks and then their population shrinkage rate will slow to about 100 to 300 bees per days for the next three to four weeks. By November, a colony shrinkage rate will be about 25 to 50 bees a day.

Dramatically reduced rates of colony decline in October and November are directly attributable to a significant reduction in worker bee mortality rates that begin in October. Once the change in worker bee longevity occurs, colony populations stabilize at a level determined by the amount of brood the colony is able to rear after mid-to late August and the proportion of these bees that are still alive in the colonies when the worker bee longevity becomes extended. The average colony's adult bee population stabilizes at approximately 11,000 to 16,000 bees by early December (Harris, 2009). Between mid-August and early December a colony's population declines from between 55,000 to 70,000 adult bees to approximately 11,000 to 16,000 bees. A net decline of more than 35,000 bees. However, most of these 35,000 bees use colony resources until they die and without having contributed significantly to the development of the winter colony. These bees are on an expensive retirement program at the beekeeper's expense! Consequently, these excess bees should either be disposed of or used to produce new colonies.

This study investigated using these "excess bees" in colonies immediately after the honey flow tapers off after mid-August to start new colonies. The new colonies were produced by dividing colonies into a parent colony with the old queen and a daughter colony with a newly mated queen.

Originally, the production of new colonies was scheduled to begin mid-August but the project's start was delayed until 23 August when the funding became available. The latter date may provide some insight into how late in August new colonies can be produced and still provide acceptable results.

Methods

General Colony Management: The experimental colonies not already present at the Winter apiary location were transported to the Winter apiary at night and arranged into their respective treatment groups.

Colonies were provided with waxed inner covers on 4 September. The inner covers provided colonies with a top entrance and a centrally located hole through which the bees could assess inverted pails of medicated sugar syrup placed above the colonies. A hive body was placed on top of the inner cover. A two-inch thick rectangular Styrofoam block with a centrally located two-inch diameter hole was placed into the empty hive body. Feeder pails containing medicated 1:1 sugar syrup were then inverted and placed above the centrally located hole in the Styrofoam. Each colonies was supplied with 12 litres of medicated sugar syrup.

Colonies were wrapped for Winter on 25 October 2013. With the exception of the vertically split colonies, all colonies were wrapped with standard commercially available black insulative wraps and provided with nine inches of insulation above their inner-cover. Each pair of "vertically split" colonies was wintered inside a Styrofoam insulative carton covered with black, plastic, stretch-wrap film.

On 8 April 2014 and 20 April 2014 colonies were temporarily unwrapped examined and provided with Global's pollen supplemental strips containing 15% pollen and 8 liters of medicated 2:1 sugar syrup. The Winter insulative packing materials were permanently removed on 2 May 2014.

Colonies were supplies with pre-weighed hive bodies containing 9 standard Langstroth frames as required.

Experimental Design: This experiment was designed to reflect how a commercial beekeeper might implement the experimental procedures. The main criteria for the experiment was that experimental treatments could be implemented quickly, required minimal effort, and could be accomplished by individuals with little or no beekeeping experience.

The experimental colonies were obtained from several different apiaries. These colonies were not equalized in any manner. Colonies were not randomized between treatments. Colonies contained queens of unknown age, except for the treatment A, where the queens were known to have been reared in May 2013. All queens had been reared from stock selected by the beekeeper.

The only criteria for colony inclusion 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 colonies population strength by examining ever frame.

All colonies were feed 12 litres of a Fumagilin© medicated 1:1 sugar syrup and treated with Apistan© mite stripes prior to wrapping the colonies for winter.

Colony Population Estimates: Honey bee colony populations were assessed using the Harris population methodology (Harris, 1985).

The initial adult colony populations were estimated using the Liebefeld estimation methodology (Imdorf & Gerig, 1999).

Subsequent, colony population development was estimated by treating the developing colony as being composed as a series of worker bee subpopulations. Each subpopulation was estimated from sealed brood estimates taken at regular 12-day intervals. These estimates were obtained by superimposing a grid containing an array of squares over the sealed brood and estimating the area occupied by the sealed brood.

Egg and larvae estimates for each subpopulation were estimated using the assumption that the egg stage lasts three days and the larval stage lasts six days. Survival rates for eggs and larval were those observed by Sakagami & Fukuda (1968). Adult bee survival was determined from a series of newly emerged workers that had been were individually marked with a different colour of fluorescent paint (Harris, 1979). When worker bee survival data was not available, their survival was estimated from life table data (Harris & Harris, unpublished).

Weight Estimates: Colonies were weighed and their honey production determined with a Brechnell S150 platform scale. Honey consumption during the winter was determined from individual colonies weighed on 25 October 2013 and again on 2 May 2014. All weighs were recorded in kilograms.

Honey production for the respective colonies was calculated as the difference between empty hive bodies before being placed on colonies and their weight when they were removed for honey extraction.

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. The samples were sent to the Saskatchewan Bee Laboratory for analysis.

Varroa mite infestations and *Nosema* infestations were treated prophylactically.

Apistan miticide stripes were inserted into colonies on 14 September to control *Varroa* mites. The Apistan stripes were removed from the colonies the following spring on 14 May 2014.

Five grams per litre of Fumagilin-B in 12 litres of a 1:1 sugar syrup fed was fed to the experimental colonies before they were wrapped for Winter to control *Nosema* infections during Winter. In the Spring, colonies were fed an additional eight litres of Fumagilin-B treated 2:1 sugar syrup.

Experimental treatments: The colonies were assigned to the following treatments.

Treatment A: Eleven colonies receiving the *standard Winter* preparation treatment utilized colonies that had been used in a field experiment during the Summer of 2013 (Harris, 2014). These colonies were moved to the winter apiary site on the evening of 27 August.

Treatment B: Four colonies received the *"horizontal split"* treatment to produce eight colonies. Each colony in this treatment group had their honey, bees and brood alternatively transferred into two standard Langstroth hive bodies. 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.

After the bees had stopped flying in the evening, the top hive body was removed and provided with its own bottom board, lid, and a caged queen if her location had been determined. The colonies were then relocated to the winter apiary site. After three days, colonies with unknown queen status were inspected and queenless colonies were provided with newly mated caged queen.

Treatment C: Ten colonies received the "*vertical split" treatment* to produce 20 colonies. These colonies were colonies already located at the Winter apiary site. The colonies were each divided into two side-by-side colonies occupying the same physical location as the parent colony. The parent colony was placed on the hive lid directly in front of its previous 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 to each daughter colony. 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 assess for brood diseases and the presence of eggs or larvae to confirm the presence of a queen. If the queen was located as the frames were being transferred, the colony was marked to indicate which colony contained the old queen. The queenless daughter colony was provided with a caged newly mated queen.

Treatment D: Four colonies received a "*truncated colony"* treatment. These colonies retained all the adult bees contained in the lower standard Langstroth hive bodies and all the brood except for one frame with open brood. A queen excluder was placed above the lower hive body. A frame with the 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 body along with its frames, bees and its one frame with open brood where removed from the parent colony and provided with its own bottom board, lid and a caged queen. The parent and daughter colonies were then moved to the winter apiary.

Treatment E: Four colonies received the ``Quasi Package`` treatment. These colonies were the daughter colonies made from the colonies receiving Treatment D.

Results and Discussion

Winter & Spring Colony Loss: Colony mortality was quite variable between the five treatments ranging from zero percent to 25 percent. It was lowest in colonies where the colony populations were not reduced after the honey flow and highest in colonies where the colony's population had been split in half and wintered in standard Langstroth hive bodies. The differences between treatments most likely reflected the number of colonies in each treatment, or general colony management, or colonies becoming queenless in late Winter or early Spring; rather than a treatment effect.

On 8 April 2014 at the first inspection, colonies were examined for sealed brood and the presence of marked worker bees but not for the presence of a queen. Five of forty-seven (10.6 %) colonies had died during the Winter. The remaining 42 colonies initially appeared to have survived the winter in satisfactory condition.

The 11 colonies from treatment A, the standard pre-Winter management treatment group, had all survived the winter. However, during the 8 April colony inspection, the queen from Colony #102 fell off of the comb and it flew away when an attempt was made to put her back into her colony. Consequently, this colony was removed from the experiment. Colony 104 was queenless on 2 May and removed from the experiment.

It should be noted that colonies from treatment A contained more honey in October that colonies in the other treatments and that the colonies in Treatment A had been requeened in early July 2013. There average hive weight on the 22 of October was 66.70 kilograms (146 pounds). After subtracting 25 kilograms for the weight of the equipment, these colonies had 41.7 kilograms (91.7 pounds) of honey available to them. A well-filled hive body will contain between 21.5 to 25.5 kilograms (47.3 to 56.1 pounds) of honey (see Table 1 & Table 2).

Six of the eight colonies from treatment B, the "Horizontal split" treatment, survived the Winter. Colony 201 and Colony 203 died during the Winter. Both of these colonies exhibited symptoms consistent with having had a significant *Nosema* infection. There was a considerable quantity of fecal deposits around the hive entrances. There was also the possibility that these colonies had used most of the honey within the Winter cluster and were not able to access the full frames of honey on either side of the Winter cluster. Both of these colonies had above

***Table 1** – Pounds of honey consumed between October 25, 2013 and May 2, 2014.*

Pounds of Honey Consumed per Colony between 25 October 2013 & 2 May 2014											
Treatment A		Treatment B		Treatment C				Treatment D		Treatment E	
Standard		Horizontal Split		Vertical Split				Trucated		Quasi Package	
Colony	Weight (lbs)	Colony	Weight (lbs)	Colony	Weight (lbs)	Colony	Weight (lbs)	Colony	Weight (lbs)	Colony	Weight (lbs)
101	61.16	201	winter loss	301	33.16	311	40.34	209	44.31	213	51.98
102	58.82	202	47.09	302	37.30	312	40.34	210	71.83	214	39.15
103	59.66	203	winter loss	303	50.53	313	winter loss	211	41.84	215	56.92
104	65.96	204	55.69	304	39.24	314	winter loss	211	53.09	216	48.77
105	61.99	205	52.12	305	30.29	315	33.51	212			
106	51.01	206	49.30	306	47.84	316	winter loss				
107	73.72	207	45.37	307	48.94	317	31.00				
109	58.95	208	47.53	308	46.16	318	28.57				
110	54.63			309	34.83	319	34.97				
111	49.34			310	39.86	320	36.24				
112	56.84										
Mean	59.28		49.52				38.42		52.77		49.21
SE±	4.19		1.55				1.62		6.80		3.75

average population on 22 October 2013. Colony 202 also showed symptoms consistent with a *Nosema* infection and was removed from the experiment on 2 May after it had become queenless.

Three of the 20 colonies from treatment C, the "vertical" split treatment died during the Winter. Colonies 313, 314 and 316 appeared to have died because not all of their Winter honey supplies had been placed in the upper five-frame hive body. Apparently, they were not able to access all the honey the hive contained. There were still frames with honey in the lower hive bodies but these colonies appeared to have been unable to access it during the winter. Consequently, they starved. Colony 316's small colony size may have also contributed to its death. Colony 316 reared small amounts of brood after 23 August 2013 and consequently its population on 10 October 2013 was less than half the average vertically split colony. At least two of these three colonies would likely have survived the winter had the upper hive body contained five full frames of honey. Colony 311 was queenless on 8 April and was removed from the experiment.

All four colonies in treatment D, the "truncated" population treatment, survived the Winter. However, colony 211 was observed to be queenless on 8 April while colony 209 was observed to be queenless on 20 April 2014.

All four colonies in treatment E, the "Quasi package" treatment survived the Winter. However, colony 213 was queenless on 8 April and colony 216 was queenless on 20 April 2014.

On 20 April 2014, during the second Spring colony assessment, treatment C, D, and E each contained one additional queenless colony. Colonies that had not resumed brood production by 20 April in response to having been supplied with pollen supplement and medicated sugar syrup on 08 April were queenless and died before 2 May 2014.

On 2 May, during the third spring colony assessment, colony 104 in treatment A and colony 202 in treatment B had become queenless. Colony 202 also had symptoms consistent with a *Nosema* infection which may have contributed to the death of its queen.

Colonies that had become queenless after the third colony assessment on 2 May were not removed from the experiment because they were able to replace their queens.

More colonies died in early Spring than during Winter. Five colonies died during the Winter and eight colonies died in early Spring. The colonies appear to have died because of: 1) inaccessible or inadequate honey supplies during Winter – three colonies, 2) severe *Nosema* infections – three colonies, 3) queen loss – seven colonies or 4) colony manipulation – one colony. Colony losses did not appear to be related to the experimental treatments. Of the seven colonies who's death was attributed to queen loss in Spring, four of these colonies contained queens that were reared in 2013 and three colonies contained queens that had been in their colony for at least one year.

Winter Honey Consumption: Honey consumption by experimental colonies between 25 October and 2 May is shown in Table 1. When analysing these data, it is important to remember that by 25 October 2013, all colonies had already undergone a substantial reduction in adult bee populations, which likely contributed to smaller difference than if the weights had also include the honey consumed between the 23 August 2013 and 25 October 2013.

Treatment A: The 11 colonies receiving the "standard" pre-Winter management practices for over-wintering colonies on the Canadian Prairies consumed an average of 26.89 ± 0.93 kilograms (55.59 ± 4.19 pounds) or about 142 grams (0.29 pounds) of honey per day between 25 October 2013 and 2 May 2014.

To put this into perspective, a well-filled Langstroth honey super only contains 20 to 25 kilograms (44 to 55 pounds) of honey. For an "average" colony to survive the Winter, it would appear that it needs access to at least one Langstroth hive body completely filled with frames of honey and probably more. Colony 107 consumed 33.44 kilograms (73.72 pounds) of honey which would amount to more than a well-supplied Langstroth hive body with nine frames of honey.

Most colonies need to be supplied with even more honey than the average. They also need to be provided with additional honey to account for the food they consume after the honey-flow during September and October and what they consume during May before the willows and dandelions start flowering. Colonies also need additional honey supplies to account for honey stores that are not easily liquefiable or easily accessible. Honey stored in frames below the colony in the lower hive body of a two story hive are not accessible during the Winter.

Failure to provide colonies with enough honey during the Winter may be the main reasons that many colonies die during Winter! Especially, when it is not possible to feed colonies in early April because they are still buried in snow or their apiaries inaccessible. The honey consumption data in Table 1 also includes the 8 kg of sugar syrup fed to colonies in April.

Treatment B: The eight colonies from the "horizontally" split treatment consumed an average of 22.46 ± 0.70 kilograms (49.52 ± 1.55 pounds) of honey. This was only

4.43 kilograms (9.8 pounds) less honey consumption per colony than consumed by colonies that had not had their populations reduced prior to Winter.

Treatment C: The 17 colonies from the "vertically" split treatment consumed an average of 17.43 ± 0.74 kilograms (38.42 ± 1.62 pounds) of honey. The reduced honey consumption per colony observed was what should have been anticipated. The same number of bees were being over-Winter as in Treatment A, except they were contained in two hives instead of one.

Treatment D: The four colonies from the "truncated colony treatment consumed an average of 23.94 ± 3.8 kilograms (52.77 ± 6.80 pounds) of honey. This was only 1.48 kilogram (2.82 pounds) less honey during the Winter than the colonies that had not had their populations reduced prior to Winter.

Treatment E: The four colonies from the "Quasi package" treatment consumed an average of 22.32 ± 1.7 kilograms (49.21 ± 3.75 pounds) of honey.

Although, the experimental colonies used less honey than the standard colonies. It is unclear why the horizontal split colonies, the truncated colonies, and the quasi package colonies ate more honey than the vertical split colonies. It would appear that the vertically split colonies may have been smaller than the other treatments. See Figure 2.

Honey production: Honey production per colony is summarized in Table 2. The green highlighted colonies were colonies that had received new queens in August 2013. The blue highlighted colonies were colonies with queens that had been through at least one Summer. The colonies in treatment A had been requeened in early June 2013. For a colony's honey production to be included in Table 2, the colony had to be queen-right on 20 April 2014. Colonies with "failing" queens or queens that were being superseded after this date were included in the honey production averages for their respective treatments. The low honey producing colonies in Table 2 were from colonies with queen-related problems or colonies that started the season with lower than average populations.

As a consequence, honey production was quite variable between treatments and within treatments colonies. The highest honey production was recorded by Colony 112 at 187.6 kg (413.5 lbs) of honey. The lowest honey production was recorded by Colony 208 at 13.9 kg (30.7 lbs) of honey. Queen replacement or queen supersedure during May and June had a greater impact on honey production than when it happened in late July or August.

Average honey yields per colony in Table 3 and Table 4 were consistent with those reported for commercial honey producing colonies in Saskatchewan. Average honey production for: the standard managed colonies, the horizontal split colonies, the vertical split colonies, the truncated colonies and the quasi package colonies were 125.2 kg (276.0lbs), 64.61kg (142.4lbs), 110.7kg (244.1 lbs), 143.6kg (316.5lbs), or 106.7kg (235.2lbs) respectively.

Meaningful, honey yield comparisons between treatments was made difficult because of Spring colony losses which left two treatments with only a couple of colonies each. Consequently, the comparison were based on the honey production that should have been expected from the original 18 colonies had they not been split in half on 23 August. If these colonies had suffered the same Spring loss as the colonies receiving the standard treatment (10 %), treatment colony honey yields should be based on 16.2 colonies (18 *.9). Had these colonies not been split they should have been expected to yield 2028.2 kg or 4470.4 pounds of honey. The honey yield from these colonies after splitting them in half was 2383.1 kg or 5285.8 pounds of honey despite the high Spring colony losses. Splitting the colonies in the Fall netted 354.9 kg or 782.4 pound more honey than had the colonies not been split in half the previous Fall. With better colony management, differences in honey production could be expected to be 1000 to 2000 pounds larger.

***Varroa* mite, Tracheal mite & *Nosema*:** Nurse bees were sampled for the presence of tracheal mite, *Varroa* mite and *Nosema* at the beginning of the experiment on 4 September 2013 before the colonies were treated to control: tracheal mites, *Varroa* mites and *Nosema.* Colonies were resampled and on 14 May 2014 after the Apistan® stripes had been removed from the colonies and again on 30 August 2014.

The Apistan® stripes were left in the colonies longer than recommended on the product's label by its manufacturer. The Apistan® label recommends that these stripes be kept in the hives for at least 42 days but no more than 56 days (eight weeks). In this experiment, the stripes were left in the colonies much longer because it was not prudent to open the colonies during sub-zero temperatures to remove them. Consequently, the mite control data provided is only for information and does not constitute a recommendation for use that would be contrary to label directions.

Tracheal mites were not detected in any nurse bee

Pounds of Honey Produced per Colony in 2014

Treatment A		Treatment B		Treatment C				Treatment D		Treatment E	
Standard		Horizontal Split		Vertical Split				Trucated		Quasi Package	
Colony	Weight (lbs)	Colony	Weight (lbs)	Colony	Weight (lbs)	Colony	Weight (lbs)	Colony	Weight (lbs)	Colony	Weight (lbs)
101	184.2	201	winter loss	301	133.4	311	April loss	209	April loss	213	April loss
102	368.3	202	April loss	302	101.0	312	323.0	210	334.1	214	176.7
103	April loss	203	winter loss	303	148.6	313	winter loss	211	April loss	215	293.7
104	April loss	204	210.5	304	122.2	314	winter loss	212	298.9	216	April loss
105	274.6	205	152.9	305	269.6	315	217.9				
106	149.4	206	217.8	306	109.7	316	winter loss				
107	293.6	207	100.4	307	229.3	317	276.3				
109	149.8	208	30.7	308	317.3	318	242.0				
110	293.1			309	393.7	319	213.8				
111	357.0			310	148.9	320	191.5				
112	413.5										
Mean	276.0		142.4				244.1		316.5		235.2
SE ±	32.3		20.5				21.4		17.6		58.5

Table 2 *– Pounds of Honey Produced per Colony in 2014.*

samples taken from any of the experimental colonies in 2013 and 2014.

Varroa mites were detected in nurse bee samples collected on 4 September 2013. Colonies in treatment A, treatment B, treatment C, treatment D, and treatment E had an infection rate of 63.64% (7 of 11), 25% (2 of 8), 25% (4 of 20), and 0% respectively. *Varroa* mites were not detected in any of the experimental colonies sampled on 14 May 2014 or on 30 August 2014.

Nosema infections were detected in nurse bee samples collected on 4 September 2013. Colonies in treatment A, treatment B, treatment C, treatment D, and treatment E had colony infection rate of 81.82% (9 of 11), 25% (2 of 8), 25% (4 of 20), 25 % (2 of 8), and 0% respectively. The spore counts were relatively low and ranged from 37,500 to 450,000 spores per bee.

On 14 May 2014, 20% (2 of 10) of the colonies in treatment A; 33.3% (2 of 6) of the colonies in treatment B; and 0% of the colonies in treatment C; D; & E tested positive for *Nosema*. Three colonies from treatment B showed visual symptoms that would have been consistent with being infected with *Nosema*. Two of these colonies (colony 201 & 203) died before the colonies were inspected on 8 April and a third *Nosema* infected colony (colony 202) became queen-less and died shortly after the nurse bee samples were collect on 14 May 2014.

On 30 August, 20% (2 of 10) of the colonies in treatment A; 20% (1 of 5) of the colonies in treatment B; and 0% of the colonies in treatment C; D; & E tested positive for a *Nosema* infection.

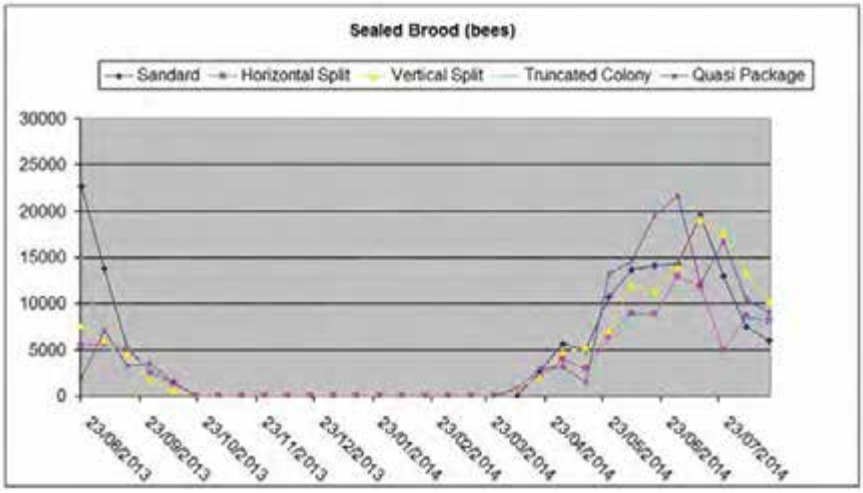

Figure 1. *Seasonal changes in Sealed Brood Product in Honey Bee Colonies near Southey, Saskatchewan between August 23, 2013 and August 18, 2014.*

Worker Honey Bee Longevity: Worker bee longevity in a healthy colony during the Summer should be between 33.25 and 36.52 days and over 80 days for worker bees emerging in September and October. Worker bees marked on 6 June 2014 had an average life expectancy of 34.22 days. Worker bees that emerged on 4 September 2013 had an average life expectancy of 105 days. On 13 July 2014 one of the bees marked on 4 September 2013 was still present in a colony 312 days after it had been marked.

Sealed brood: Sealed brood trends for all treatments are shown in Figure 1.

Seasonal changes in sealed brood production are important when attempting to understand how a colony will develop. They predict pending changes in adult populations. A decrease in sealed brood production signals that colonies population growth is about to be negatively impacted.

When interpreting the sealed brood data in Figure 1, it is critical to remember that these colonies were not equalized before the experiment began and that initial difference may relate to the apiary that the colonies originated, the age the queens in the colonies, how they had been managed and the number of colonies in each treatment. Relating the general trends in sealed brood production to what is happening in the environment is what should be focused upon.

In late Summer 2013, at the beginning of this experiment, sealed brood production was expected to decline in response to declining pollen availability, declining ambient temperatures and possibility declining day length. The later most likely exerting its effects indirectly through its effects on flower plants and ambient temperatures.

Sealed brood production trends exhibited in Figure 1 by colonies in Treatment A would be typical of sealed brood production in most honey bee colonies in western Canada after mid- August. However, even this will depend upon the proximity of the colony to flower crops and when cultivated crops like canola had been planted.

After 23 August 2013, sealed brood production declined rapidly when late seeded canola and other plants ceased flowering. By mid to late October, colonies were only producing small amounts of sealed brood or they had temporarily ceased rearing brood. This trend was apparent in all experimental treatments except where the initial sealed brood quantities in the respective treatment had been artificially manipulated.

Colonies from treatment A and treatment D contained the most sealed brood at the beginning of the experiment on 23 August 2013 because the treatments applied to these colonies either did not alter sealed brood production (treatment A) or produced only very small changes in the amount of sealed brood the colonies contained (treatment D).

It should be noted that none of the bees that emerge from the sealed brood prior to 23 August would be expected to survive beyond late October or early November at the very latest. Most bees that emerge from the sealed brood measured on 23 August were dead by the end of October. Consequently, the large initial differences in seal brood production by the colonies was not as significant as it might have been under other circumstances or at other times of the year.

After early-September 2013 brood production converged in all colonies. Sealed brood production was not monitor in colonies after 10 October 2013 because it

snowed on 21 October 2013 and ambient temperatures prohibited further colony inspection.

Although the graph would seem to indicate that the colonies did not rear any further sealed brood after 10 October, this assumption would likely be wrong. It is almost certain that some colonies contained small amounts of sealed brood on 22 October 2013. In addition, it is likely that many if not all colonies resumed brood rearing after 25 October in response to having been enclosed within black insulative packing materials in preparation for Winter. Harris (2008a & 2008b) documented such a response by colonies when they were only supplied with a one-inch thick sheet of Styrofoam insulation placed on top of colonies even though the colonies had not been wrapped for Winter. How long the colonies would have continued to rear brood and the amount they would have reared would be speculative. Nevertheless brood rearing in colonies during the Winter has been documented (Avitabile, 1978; Farrar, 1963; Harris, 2009). The amount of sealed brood that colonies would have produced during Autumn and Winter would have been a function of: the queen's age (Harris, 2008b) and the amount of stored pollen in the hive since colonies have a very limited capacity for workers to utilise protein stored in their bodies to rear brood (Haydak, 1935).

The small amount of sealed brood reared after mid-October would have had a minimal impact on slowing colony population decline if it were not for the fact that this brood emerged after a significant increase in worker bee longevity had already occurred. Before early to mid-October average worker longevity would have been approximately 34 to 37 days. After early-October, average worker bee longevity more than doubled – almost tripled. Consequently, colonies experienced a slower rate of population decline. Lower worker bee death rates meant that only small amount of sealed brood colonies would have been required to stabilize colony populations or to produce a minor colony population expansion during Autumn or Winter. This phenomenon has already been observed in colonies wintered indoors (Harris 2009). If colonies did not rear any brood during Autumn or Winter, the steady downward trend colony populations in Figure 2 would accurately predict a colony's size in early April.

In Spring, (8 April 2014) a few colonies in all treatments groups contained sealed brood, except for colonies from treatment A.

On 20 April, colonies were reinspected and almost all colonies had responded to the pollen supplement and sugar syrup supplies to them twelve days earlier by rearing brood. Colonies that remained broodless were also queenless. This suggests that colonies that have not resumed brood rearing after pollen supplement had been provided to them should be considered queenless and either immediately requeened or merged with a colony with a viable queen.

On 14 May, the rate of sealed brood production lessened in most colonies. This decline in brood production was likely the consequence of the colonies having consumed most of the pollen supplement supplied to them on 8 April 2014 and that an adequate supply of natural pollen was still unavailable to sustain more brood rearing.

Between 7 June and 19 June, there was another decline in the rate of sealed brood production. It is

unclear if this decline was associated with: 1) a minor reduction in available space for rearing brood associated with nectar collection from dandelions; 2) not enough pollen available to support the previous levels of brood production once the dandelions had stopped flowering; or 3) cloudy inclement weather which restricted pollen collection. Whatever the reason for the reduced brood production, the colonies responded by producing numerous queen cells as they prepared to either: replace what they may have perceived to be a failing queen or swarm.

Between the 13 July and 25 July there was yet another inflection in sealed brood production. The change was likely the result of: 1) not providing colonies with adequate space to store honey during the honey flow in a timely manner, 2) colonies becoming queenless after honey was removed with acid boards, 3) cloudy rainy weather or 4) the adjacent early seeded canola crop starting to mature.

Adult Bee Populations: Seasonal changes in adult bee populations are shown in Figure 2. These changes reflected the additive effect of adult bee sub-populations emerging from sealed brood and their respective survival rates. The adult bee population is a function of both of these variables. They are correlated. Colony populations always follow the sealed brood production trends unless they swarm or worker bee longevity is seriously affected by: a *Nosema* infection, a *Varroa* infection, colonies are relocation to another apiary or exposed to insecticides.

Because worker bee survival rates follow a seasonal trend in healthy colonies, changes in a colony`s population are primarily a function of a colony`s sealed brood production. When more adult bees are recruited/emerge from the sealed brood than die, the colony's population increases and when recruitment is lower than the number of bee dying, the colony's population declines.

At the beginning on the experiment in 2013, the average unmodified colony (treatment A) was more populous than the colonies in the other treatments. Because of the large amounts of sealed brood that these

colonies contained, these colonies did not exhibit a significant decline in their populations until after mid-September.

By 22 October 2013, the average unmodified colony (treatment A) contained approximately 22,464 bees. "Horizontally split" colonies (treatment B) with their population randomly divided in half and placed into standard Langstroth hive equipment contained approximately 12,792 adult bees. "Vertically split" colonies (treatment C) that had been placed into two vertically stacked five-frame nuc boxes contained approximately 9,587 adult bees. "Truncated colonies" (treatment D) that had had their populations reduced to 9 standard Langstroth frames of bees including 1 frame with unsealed brood contained approximately 13,610 bees. "Quasi Package" colonies (treatment E) which was formed with the bees and brood removed from the 'Truncated" colony treatment contained approximately 12,560 adult bees.

Between 22 October 2013 and 08 of April 2014, Figure 2 indicates that the adult bee populations in the normal pre-Winter treatments declined from 22,462 bees to 4,564 bees. A decline of 17,899 bees. For this to have happened, these colonies would have had to been broodless all Winter.

Visual colony population assessment in Spring suggested that colony populations were two to three times larger than predicted in Figure 2. The only possible conclusion was that the assumption that the colonies were broodless during Winter was wrong, except in colonies that were queenless during the Winter or contained no pollen after the end of October 2013.

After 20 April 2014, adult bee populations steadily increased. The highest average adult bee populations occurred in colonies during the first week of August, except in colonies that had been "horizontally split" the previous year. These colonies peaked during the last week of July because 40 per cent (2 of 5) of these colonies replaced their queen after mid-July which affected adult worker bee recruitment.

Conclusion:

Honey bee colonies contain thousands of bees at the end of the honey flow that are no longer required once the honey flow has ceased. In late August or early September, once the honey flow slowed to a trickle, these 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. This experiment consider using these bees to produce new colonies.

Splitting 18 colonies into a parent colony and a daughter colony on 23 August produced 36 colonies with large enough populations that they were able to be successfully overwinter 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. Colony survival did not seem to be affected by the size of the colony splits nor the timing of these splits. Vertically split colonies had the highest colony survival rate of all the treatments. However, this trend might not be evident had the colonies been wintered indoors.

Winter losses in the spit colony treatments were 13.9 percent (five 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. In comparison, none of the 11 colonies receiving the standards Winter preparation treatment died during Winter.

Queen 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 and colony death was aging queens. Seven of the 11 colonies that died had queens that were more than a year old.

The primary cause for colony loss 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.

With some minor management technique refinements, better results would be possible. The problem with

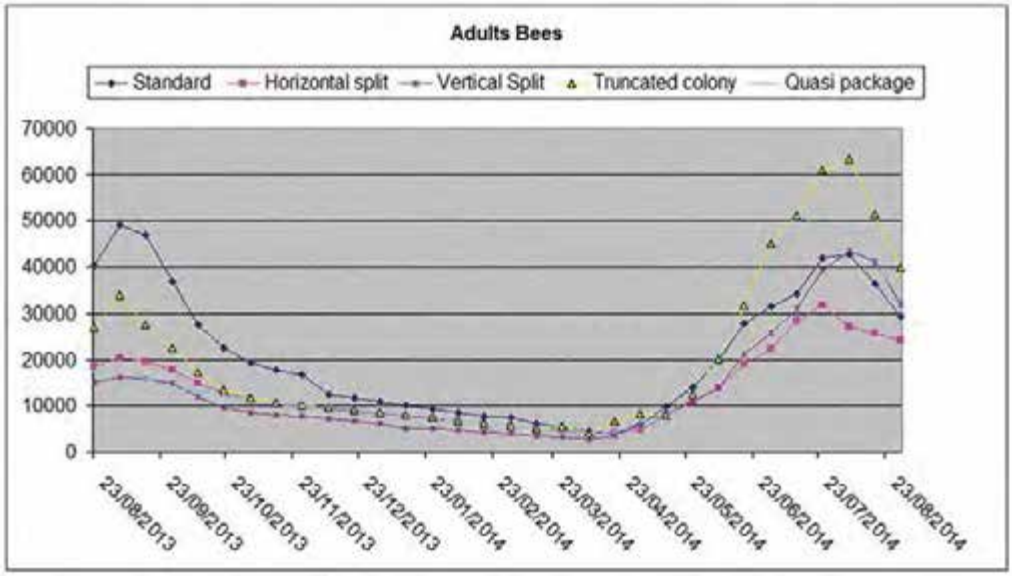

Figure 2. *Seson changes in Adult Populations in Honey Bee Colonies near Southey, Saskatchewan between August 23, 2013 and August 30, 2014.*

colonies dying from "cold starvation" could have been prevented by placing all the honey stores in the top super and feeding 12 litres or more of 2:1 sugar syrup instead of 12 liters of a 1:1 sugar syrup that was fed to the colonies. Queen loss problem during Winter and early Spring could be rectified by requeening all the colonies rather than just the daughter colonies.

Even with colonies dying during Winter or early Spring, there was a net gain of seven colonies without considering normal colony loss during Winter. The split colonies produced about 782.4 more pounds of honey than would have been produced by these colonies had not been split in August. The split colonies averaged 210 pounds per colony based on 25 colonies or 291.9 pounds per colony if you base the average on the original 18 colonies.

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

It is clear that colonies need to rear small quantities of brood during Winter to replace some or all of the bees that die during Winter. This may require pollen supplements to be provided to colonies just prior to their being wrapped for Winter. BC

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Sustainable Be

A Beekeeping Simile . . . Solving beekeeping problems is like trying to put

A challenge in beekeeping many can relate to – which hole to stop first? "If it isn't one thing it's another" is the adage that some say with regard to how to keep honey bees alive. Honey bees are "livestock" and as such there is an unseen and visible world threatening them daily. Each year lessons are sadly learned as a result of a mistake both intentional and unintentional. These lessons vary from apiary to apiary, hive to hive, and beekeeper to beekeeper. One apiary may not have one issue yet another apiary is overrun with a threat. One colony may appear healthy yet the one inches away is looking towards that "heavenly light at the end of the tunnel."

No one can say, "if you learn this – you won't fail as a beekeeper." Truth is everyone fails, it is how each recover from a failure that varies. Many chalk it up and say, "damn it, I am done." Others say, "I'll buy another package next season." The list continues, "I'll try a different queen type next time" or "I'll find a mentor" or "I'll take a class" or "bless this hive dear God that I don't kill them again despite my ignorance!" You will though, colony after colony will fail and each time is a learning experience you can share or file away.

Another challenge is a tough piece of meat to chew on, "it seems that other beekeeper knows nothing and does little and his little nightmares survived." What gives?

Over 20 years these eyes have watched over colonies. Death has come to many colonies, swarms, yards, by everything imaginable included bulldozer! It truly is depressing when an entire apiary is destroyed, but it happens far too often. Some are loaded on a thief-mobile and roll away your world. Some are turned into what looks like a child's domino collection after a day of uncontrolled play-time. What ever the challenge another will mount its horrific face and shout "boo"!

What can be said to alleviate the failures? The answer is an obvious one and it isn't to take up another hobby like fishing. Sustainability in beekeeping is elusive but it is the answer.

Buying a package of bees is like going to a nursery and acquiring a seedling or "start" ready to plant. It takes little or no insight of the gardener as to what it took to get it to that tender size. All that is hoped is that it is matured enough to survive despite what nature throws at it and what is done or not done after arriving in your garden. It is hoped that seedling is "hell bent" on life so all you do is give it space. Similar to a bee colony, many buy a package of bees with an unfamiliar mated queen in hopes the two will learn to love each other as a 21st century family at least. Sometimes this "match-maker" style of union fails. At that point, if caught soon enough a new queen can be purchased from a "royal queen maker" and again introduced like "Snow White" in hopes of the loving kiss.

The key above was the availability of a new "Snow White."

Sustainability comes from understanding how to

Mini mating nuc.

Raising a queen.

They need good food.

Albert **Chubak**

plugs in a sponge to stop water.

create a colony from a fertile seed (egg). Printed in the genes of each bee is a list of instructions of what to do when a problem occurs. One of the ancient instructions is how to create a new queen. A queen can lay thousands of fertile female eggs a day which could ALL become a queen under the right conditions. The instructions they follow are simple, when the scent of the queen disappears the nurse bees, or the ones feeding her and attending to the young, innately decide to keep feeding the tiny larvae royal jelly. From three to five days after the queen goes missing other replacements are started. The DNA instructions causes young bees to assess the cell length and extend it downward only for a future queen. Once the larva has aged and grown to about day eight these amazing insects cap the cell and protect it from all outside variations. This "princess" is now incubating. Once she has developed into adulthood this maturing teenager wants to tackle the world. She fights her way out and then she dries and her Chitin armor hardens. Again, back to the "instructions", once she is perfected the senior ladies of the hive kick her out into the world and escort her to the local drone hang-out (Drone Congregation Area). She may return or she may die, so others were prepared along with her and they too are sent off in hopes of finding lucky boys (drones). Each area hopefully has a drone hang-out where they seek out their princess. All the effort of the successful drones end in death. The newly mated queen returns and if mated enough she begins her mission in life to lay eggs and build a colony.

The baffling question many ask, "how do I raise a queen"? Not much has to happen other than the queen being removed and there being "young open brood" and resources such as "nectar and bee bread".

Mating nucs are quite small, like a Mini Urban Beehive, single box. This tight confined area is suitable for a small cluster of bees to make a new "Snow White". They need resources at their disposal, such as honey or sugar water (suggest adding supplement to sugar water increasing life supporting nutrients, and protein for use in making "royal jelly". Water needs to be available so the bees can increase the humidity and will maintain the perfect temperature with their wings and aerobic generated body heat.

By having an understanding of how bees make new queens, the lesson on how to grow a colony emerges. It is insightful and valuable to have a second hive or a colony in waiting to take resources from to support another failing or less successful colony. Not much is needed when a queen has disappeared and the colony is "broodless"; the beekeeper only needs to add a frame of young open brood and they will take care of the rest. Three to five days later queen cells appear and the cycle starts again.

Many don't have a second colony or access to an open brood frame. That is like having a house without an insurance policy. Something happens and without the insurance it becomes a total loss or nightmare. The second colony does not have to be huge, nor does it have to be heavily populated. A small Mini Urban Beehive

To raise a queen you'll need eggs or very new open brood.

A second hive.

A two-queen system.

(MUB) in a single box can supply a queen to a larger colony and the small MUB goes and regenerates a new queen. If the little MUB colony grows to fill the 4 boxes, take brood frames and add it to the larger colony so it grows even faster – **"a separate two queen system."** This can be achieved by adding mini frames with wire or zip-ties inside a deep frame, or just add a 28-frame comb box to an existing hive.

Any failure can be overcome if another colony is available. Some use a second deep Langstroth colony for regeneration. Sharing deep frames takes away growth from the large growing colony and if the failing colony still fails then the entire huge frame was lost in the process. A tiny mini frame of open brood the size of a palm is all that is needed. If there are eggs still on that brood frame, it will be okay.

Small colonies are quite enjoyable to maintain and grow. Their temperament is docile due to the need to regenerate a queen for survival. This permits time for the beekeeper to learn and see what happens and the length of each cycle. A valuable lesson in beekeeping that should NOT be missed.

Raising queens can be complex or simple depending on how many are wanted.

This is the key to sustainability, ability to recover from the beginnings of a failure. How many colonies could be saved if available resources were near? Most problems can be rectified before loss sets in. The other valuable asset of the MUB is its size. A large box can be too big for a tiny colony to grow in.

Remember this colony has to control its environment to succeed. Too big of a space and these little ladies cannot maintain sufficient humidity or heat suitable for growing young. BC

Basic Beekeeping Is Not Just For Beginners

Basic beekeeping is fine

Among my many annoying characteristics, I have a particular one that especially frays my immediate family (and many others, no doubt). I will pick out a small aspect of life and harp on it. And harp on it. And harp on it. Finally, I tire of what the minor issue has been, and I move to another issue that is equally annoying.

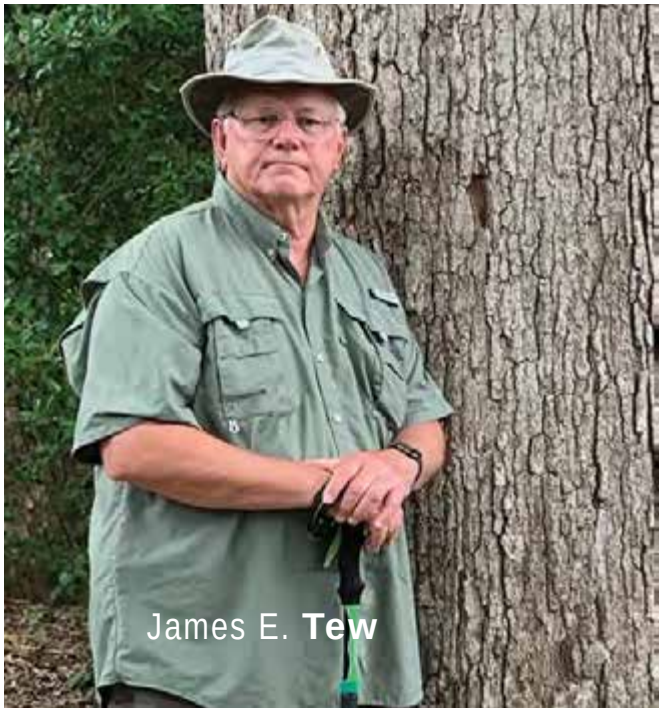
For quite a long time, I went on and on about common redundancies in the English language. I enjoyed picking them out, but others around me quickly tired of the game. Some common ones were: (1) two halves (something halved can only be two parts), (2) hot water heater (why would you want to heat hot water?), (3) past history (all history is past), (4) ATM machine (one is saying automatic teller machine machine), and finally, (5) Tuna fish salad (tuna is fish, so the salad is simply tuna salad.). Got enough? There are hundreds more. But enough already.

Just now, I am tinkering with the word, *"fine."* I'm just a bee guy, but it would seem to me that the word is presently little more than verbal filler or verbal punctuation. It's a bit of a junk word now. We all know the actual definitions for "*fine,*" but absolutely **everything** can be fine now.

Hypothetically – Marge says, "*Chuck, I'm leaving you and I'm taking everything you own." Chuck replies, "**Fine**. But I will fight you forever." Marge replies, "That's just **fine**! You will never win!"* In reality, neither Marge nor Chuck are *fine* (happy) with this situation, but somehow, *fine* becomes the word that is used in their responses. Just watch how often this word is whimsically used in everyday conversations or in our society.

Basic (basically) is fine's first cousin

Another very common word that is cheap and easy to use is "*basic.*" Rather than present a discussion about *basic* as I did with *fine*, I want to go straight to my beekeeping thought. What is basic beekeeping? What is a basic beekeeper?



Basic beekeeping is fine, just fine.

I'm asking this question for a personal reason. Here it is. After all these years, I suspect that I am, at present, simply a basic beekeeper. During other periods of my bee life, I have been several other types (stages?) of a beekeeper. Yet, according to beekeeping parlance, I was a beginning beekeeping just a bit short of 50 years ago, and here I am, at 71 years of age, yet again, a basic beekeeper. *(There is room at this point for hundreds of jokes and insults. Insert the one of your choice at this juncture.)*

Basic vs beginning

I see basic beekeeping as "bare bones" beekeeping. I see beginning beekeeping as the introductory stage when a new beekeeper is learning everything about the craft. What bee books are needed? What authorities have good information? What protective gear to use? How to install a package? The list could go on for pages and pages.

What the beginning person is learning is basic beekeeping. That beginning person can stay at the basic stage or, as most of new beekeepers do, they can move on to more advanced topics and interests. As these beekeepers advance, they upgrade their equipment. They explore more complex avenues of bee biology. They push their colonies to produce surplus honey, and maybe even comb honey. They are no longer beginners, but neither are they still basic beekeepers. Other than *experienced beekeepers*, I don't know of a standardized name for beekeepers who have passed beyond the initial phase of beekeeping.

Jim, where is this thought going?

Basic beekeeping is not just for beginners. One could keep bees for decades and still be considered a beekeeper who keeps their colonies in simple equipment and does not buy a lot of gadgets or new hive product designs. Basic beekeeping could (theoretically) be considerably cheaper than the complex systems of managing bee colonies that so many of us use.

A simple but rewarding basic bee project. The bees are kept in medium supers while deeps are used as feeder shells. The beekeeper is an experienced keeper with years of experience. (Thanks Frank, for the photo.)

A nine-deep frame (three high and three deep) observation hive I built many years ago. I could enjoy exploring beekeeping with these glass hives again.

I suspect my present concept of basic beekeeping has been brought on by all the years I have dedicated to beekeeping. I have not done everything in beekeeping, but I have come very close to covering all the main topics (Some of the stages would be queen production, pollen collecting, comb honey production, commercial beekeeping, and migratory beekeeping.) Nothing is special about my life's bee experiences. Nearly all of us followed the same bee path.

But for me, it's is more than that. While working for Ohio State, I had a deluxe laboratory. The lab had an extracting facility large enough to run about 1,000 colonies. Four hundred was the most we ever managed. There were three trucks one with a heavy-duty lift gate. An adjustable loading dock was in the building for unloading heavy honey. The lab had queen producing facilities – including instrumental insemination equipment. There was a large storage building for storing all the various pieces of equipment – both very old and very new. It was a great way to keep bees. Though we could teach basic beekeeping, we were certainly not basic beekeepers. None of this description is a boast. Keep reading, please.

After I retired, the lab and its facilities all went away. It is the natural scheme of things. It was never mine. So, it's probably just me, but I now find scant excitement in setting up a small extracting line after having had access to such high-level processing equipment. I don't know what other established basic beekeepers do, but now, when I have any honey, I just have it contract extracted[1].

For those of you who are disappointed in my honey-extracting confession, I ask you to consider the work that is required of me, working alone, to set up and perform the extracting process. Then clean it up and store it all away. I am doing this basic beekeeping for enjoyment – so much as possible. At times, even basic beekeeping is still work.

There is no standard basic beekeeper

I don't know a definition for an experienced, but still a basic beekeeper. This type of beekeeper most likely only keeps a few colonies, but they would be most likely be kept well (or not). The hive equipment used is standard without a lot of experimental diversity. Only a single veil is needed. One smoker. A single pair of gloves are kept somewhere under the truck seat. One or two hive tools would suffice. The hive stands are probably improvised, but not necessarily. If there is an extractor, it is small and portable. An electrically heated knife would be a deluxe purchase, but it could probably be justified. Buying expensive replacement queens may or may not happen. That would be the basic beekeeper's call. This beekeeper must have a sensible but simplistic method of mite control. The beekeeper may or may not be a swarm chaser. If colony numbers increased over time, the basic, but experienced beekeeper would likely be forced to move from the "basic" category. No, I do not see such a person as necessarily a hobby beekeeper.

*"Jim, it sounds as though you are describing **boring** beekeeping rather than **basic** beekeeping."*

Let me offer a defense of the value of simple beekeeping – but not boring beekeeping.

(1) I have had a wonderful time during my beekeeping life. I've never been bored. I listed some of the beekeeping stages above that have kept me challenged over the years. Now, I keep up with the issues and the evolution of those issues, but I don't have a strong desire to return to them at this point in my life. (But anything can change.)

At this point, I want my bees for academic enjoyment and photo/video work. Bees and grandchildren are my two common photographic subjects. At this point, rather than spending significant sums of money on bees, I spend significant amounts of money on photographic equipment that I use to photograph my bees. It's just the current phase I'm in. I don't know what the next phase will be, but I can say that as my neighborhood becomes more congested, I have a growing curiosity about returning to an earlier interest I had in beekeeping – large observation hives.

(2) In urban/suburban settings, a beekeeper may be restricted in what can be done with bees in a close neighborhood. This bee operation may be more of a hobby – like bird feeding, but none-the-less stimulating.

(3) For most of us, our bees become one of the primary focuses of our lives. It could be a bit of a surprise, but some beekeepers want their bee life balanced with their gardening life or their natural history life. For them,

[1]I know that some of you will express concern about disease spread using honey equipment to extract the honey of multiple beekeepers. Yes, there is a chance, but if common hygienic procedures are used, the risk should be small.

beekeeping is part of life's reason, and is blended with other endeavors. For many of us, beekeeping is the full thing – power beekeeping – aggressive beekeeping – knowing all we can know about bees. There's nothing wrong with that. Some others are happy with a downsized version of those goals.

I have belabored the point of my thought. In my opinion, it is "fine" to be a basic beekeeper who has considerable experience and knowledge but does not need all the extras that the rest of us require. They keep their bees simplistically.

Screened bottom boards

Occasionally, Editor Kim, asks me for responses to various beekeeping questions that have come his way. Currently, he publishes some of my responses and responses of many other experienced beekeepers and writers in the monthly column, *"Beetalk"*. Recently, a questioner was asking about the practicality of screen bottom boards. I wrote a response to this query, but I simply forgot to submit it.

But in light of my comments above about basic beekeeping, I did have an interest in Dan's question. Rare, for me, I have developed an opinion about screen bottom boards.

Question – *What do you, the experts in the field, think of screened bottom boards for Langstroth hives? Do you use them on your own hives? Dan from Southern California*

From Jim. Early on, I got on board with screened bottom boards. Anything that would help kill mites was good. Time passed and I cooled.

(1) Screened bottoms tend to be rather lightweight beneath a heavy hive.

(2) When using a hand truck, I have had issues with torn screens when relocating colonies in hives with such bottoms.

(3) On a couple of occasions, swarms, from where I know not, have positioned themselves beneath the bottom screen. To remove the swarm, I had to completely disassemble the hive – all the way to the bottom board, while unintentionally mixing colony bees with swarm bees. I call this "Chaotic Beekeeping.

(4) To protect the wire bottom, this bottom board should be "laid" on the truck while a regular bottom board can be tossed onto the truck. The screen strength varies between bottom board manufacturers. Some take real-world handling better than others.

(5) Yes, they are very useful when taking a mite count, but I have other ways for doing that task.

(6) No harm in using them, but no harm in not using them either.

A swarm on the bottom of a screened bottom board. The hive must be completely disassembled to get to it.

That was to be my response for Editor Kim's use – but now even more

The six points listed above was to be my concise opinion, but I feel my response needs more. Screen bottom boards are not all bad. I'm just making it sound that way.

(1) If you are established beekeeper who rarely moves your hives, this bottom board style works well. If the metal sheet used to close the bottom entrance for Winter seasons or for mite counts is used regularly, it, too, works well. If it is not used regularly, ladder combs and propolis can make the metal sheet hard to remove and reinsert.

If metal sheets become mixed with metal sheets from different manufacturers, putting them into the bottom board slot can be troublesome. This issue could be resolved by using screen bottom boards from only one producer. Some producers do not even use metal, but corrugated plastic.

(2) I suspect that screen bottom boards on a hive stand help the colony stay cool on high temperature days. I have no science to support my notion.

I simply prefer a substantial reversible bottom board. Am I just being old-fashioned? Due to eagerness for screened boards, I presently have more screen bottom boards than solid ones. Over time, as I slowly replace any of my hive bottoms, I will go back to solid bottoms – either wood or plastic, but that's just me.

I moved bee hives - again

Once again, I had to recently move eight beehives. In the near future, I will need to move them back. During past months, I have written about all my personal issues. Kim and I even produced a video showing the disruption, changes to my apiary, and some insurance concerns that I will have in the near future. I have thoroughly worn those topics out.

Even so, I just mentioned that screened bottom

Hardware cloth stubs snag on clothing and destroy my hands. It's worse than bee stings.

boards probably help cool a colony within a hive on a hot day. I have personal experience overheating bees in closed hives. I like to ventilate my moving hives in any way possible.

I put eight-mesh screen cloth on top of an empty deep. I staple the screen in place and cut it to size with tin snips. It's a neat and clean procedure – except for all those tiny metal ends that shred my hands and constantly snag on my breathable bee suit. Folding a part of the freshly cut edges under to present an uncut edge would help, but that would still snag too much. Maybe I could fold edges in and staple from the inside. Then it begins to be work.

What do you use to screen off hive tops when moving your colonies? No matter what you use, know this – you will never get them all in and of the bees you get into the colony, some will find a way out. All you're trying to do is to keep as many as possible inside and never, never let the bees be without abundant ventilation.

As usual,

As usual, thanks to you who could hang on during my tirade this month. No matter how my piece reads, I always enjoy beekeeping and will continue tinkering with bees indefinitely. I hope you do, too. BC

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

https://youtu.be/KqXBCRBGMZM

A video chat

BIGGER PICTURE

Jessica **Louque**

The Most Wonderful Time Of The Year

It's hard to express sarcasm in written word sometimes, but please make no mistake that the title is total sarcasm at its finest. For most beekeepers, the Summer marks a time after honey extraction with local, state, and regional bee meetings, a couple checks for *Varroa* and treatment, and maybe prepping to enter contests in your state fair or bee meetings. It's a time of chilling out with your bees because you're past the hectic time of Spring flows and swarming season and hoping for a decent Fall flow to augment Winter stores. If you're in pollination, you might have your hives set up at a farm and sporadically checking in on them.

For our family, it's a dead run into all things unholy in bees and no space in time is sacred. Didn't want to be up at 3:00 a.m. still moving bees? Too bad. Didn't want to be up at 6:00 a.m. moving bees? Too bad. Didn't want to work a 34-hour day in the bees doing assessments and applications? Oh well, get over it. It's pretty hard for me even to keep up with monthly articles at this time point.

Once we start our bee season, anything and everything can happen. For bee studies, they always start from packages so we have a clean slate, so to speak. They get put into brand new equipment, which all has to be painted (in rainbow colors, no white allowed) and assembled in enough apiary sites to keep the hives happy but close enough to feed and check everyone easily. Bobby drives down to South Carolina to pick up bees from The Carolina Honey Bee Company while the rest of us make sure everything is set up and ready to install packages. From that point on, everyone gets fed as much sugar syrup as they will take. All the colonies are frequently assessed to see who is failing, who moved to a different queen, who has disease, who needs hive bodies added, and to try to keep a handle on swarming.

For our studies like this year, hives have to be assessed then separated into apiary sites by strength based on the assessments. That means we must go to all our apiary sites, assess over 100 colonies, enter the data and sort through it, remove anomalies on both ends of the spectrum, then go back out and mark those hives to move. Then we pick up nine hives for each site and move them out to one of the 12 sites that are all at least a mile apart. It can take us a couple days to do this because you have to find all the hives that go to each site and set the sites up in a specific format in the dark. We don't move any bees in the daytime because it's too hot at this time of year to leave the hives closed. That means every site has to have the hive stands set up, scales put out for each hive, and a weather station ready to go before we can move bees.

This year, our scales didn't come in so we had to call in an emergency order to Broodminder. We were able to get a personal delivery in the same week with a good instructional visit to put out under our hives. It's a little more difficult because we had to pick up each hive after they were moved and put a scale under them, but it worked out in the end.

When you move a hive, all sorts of things can happen. The most important thing is that the queen is still alive and the colony didn't suffer any major damage. We don't want to have a colony show an effect from a treatment but it turns out we just killed a queen in transport.

After we move the hives, we do another assessment to determine the official starting point of each colony. These assessments observe the percent coverage of bees on every frame side, as well as comb coverage of honey, nectar, pollen, capped brood, open brood, eggs, empty cells, and also the presence of a queen, supercedure or swarm cells, and pests and diseases. We observe in increments of 5% and multiply out the bees by 150 bees per decimeter. It's pretty impressive in the long run to see the overall colony stats after everything is completed.

It takes anywhere from about 15 minutes for a light double to 45 minutes for a strong quad to assess the hive. We also take samples of honey, nectar, and bee bread depending on the time of year and that can add another 15 minutes per colony.

Adult bee samples to assess

Nectar sampling.

Varroa and nosema levels are taken at the beginning (June-ish), again in late Summer or early fall (pre-*Varroa* treatment) and potentially a sugar shake or IPM board to check post-treatment levels, and one more time in the Spring.

The most important part of these studies is controlling everything we can to minimize outside impact on the bees. We try to do everything we can to keep the colonies grouped into similar bee populations and food stores.

Queens are marked each year and part of the assessments keeps track of the marks on a queen so we know if a queen is the same one that we saw last time, or if the mark was chipping off and it could be the original queen but the paint is gone.

Bees after CCA.

It's not always possible but burr comb frames are removed if we can, and the better drawn hives get a higher priority. You can swap small hives with big hives to switch foragers, but in the end that usually doesn't do a lot of good because there was a reason the smaller colony was small in the first place.

When we take samples of these colonies, we want to be able to verify that the hives are "clean" and haven't been exposed to chemicals before we start a study. These samples are food stores though and we have to be careful that we don't take so much that it hurts the colony. Typically, we take a capped honey sample at the beginning of a study to see what they have stored, as well as a bee bread sample.

Nectar is taken after we do an application to see what exposure levels are based on food stores. Honey and nectar are differentiated by being capped or uncapped, and can be confirmed by a moisture level reading. Both are taken from five-frame sides to try to sample randomly in case the honey or nectar comes from different places.

If it's possible, 1 mL is taken from each frame side sampled for a total of 5 mL. It's enough to get a good amount for analysis without being too much theft from the colony. Bee bread can be much more dangerous because you're flirting with the edge between having enough to analyze and hurting a colony on their most precious food stores. Bee bread is taken from only three frame sides because it can be common to have all the pollen in just a couple places in the hive. We also only collect around 1 gram of bee bread, which is about 20 good pollen cores.

In addition, we have a monitoring hive at each apiary that we use to collect incoming pollen baskets and nectar throughout the study. We not only do a full spectrum analysis on these, but the pollen is used to see what plants the bees are visiting. If we do have a hit on a chemical, knowing what plants are foraged may help to determine why the bees were exposed. If we have cucurbit pollen show up in a sample, and we have

Pollen sample.

ridomil in an analysis, we would be able to reasonably assume these two things were associated. If it is a non-bee crop we might not be able to use the pollen, but some sleuthing can figure it out.

Most of the time if a chemical pops up we can trace it back to a particular crop on the label even if it's not typically bee attractive. We had a chemical once that was registered for a bizarre (for our area) list of crops until we learned that there was a government push to grow milo in the area and it was registered for use on milo. It looked like some foragers were desperate and raided some milo and it wasn't traceable in the pollen but was enough to show up as a hit on the residue analysis.

The summertime does have the benefit that our whole family works together to do the studies. Everybody gets a lot of experience in the bees, but also in doing research, working in the field, understanding contamination, application calculations, keeping data, Good Laboratory Practice training, and also basically making up your own stupid language because everyone is too tired to talk like a normal person.

It's a lot of hard work, long hours, weird sleep and grumpy people. It can also be good times and a lot of training and experience and really funny pictures and time with family that you might not otherwise get. It's nice to be able to teach your kids about the work that you do and

hope that some of them might want to continue in the business. Even if they don't go into our work, research can teach a lot of valuable skills for most any job. It can be the worst behavior of the bees though – I don't think any of our kids will be going down the path of backyard beekeeper anytime soon. BC

Jessica Louque and her husband, Bobby run Louque Agricultural Enterprises, a contract research business specializing in apicultural studies. And they raise bees, and children, and chickens and more at their home in North Carolina.

All The Buzzz in...

Hello Friends,

I hope you are having fun being back in school.

Bee B.Queen

Bee B. Queen Challenge

Send us one of your favorite honey recipes.

Why didn't the bee have extra time?
It was always "buzzy."
Mary Beth Byler, OH

The Great Biological Sort

Scientists need a way to organize all living things to better understand their differences and similarities in relationship to each other. They have developed a classification system to do just that – sort living things in groups by common characteristics.

Think of this classification system as sorting books in a library. The books in one library are in a group. The next group may be divided into fiction and nonfiction. Then we can further sort non-fiction books. For instance books about all animals are in one place. Then, within that group, insect books are sorted together. Within that section the books are sorted by the kind of insect: bees, ants, dragon flies, mosquitos…

Let's look at the scientific classification of the honey bee.

Kingdom: There are six kingdoms: animal, plant, single celled organisms like amoebas), fungi, bacteria, and archaebacterial. Both honey bees and humans are in the animal kingdom.

Phylum: Phylum Arthropoda includes insects, spiders, lobsters, etc. This group has segmented bodies, jointed legs, and hard external skeletons, or exoskeletons.

Class: Phylum Arthropoda is then divided into classes. Honey bees belong to the class Insecta. Other members of this group are butterflies, cockroaches, and house flies.

Order: Bees, wasps, and ants belong to the order Hymenoptera. Hymenoptera means "membranous wings." We know of 150,000 living species of Hymenoptera.

Family: Honey bees, along with bumblebees, carpenter bees, and orchid bees belong to the family Apidae.

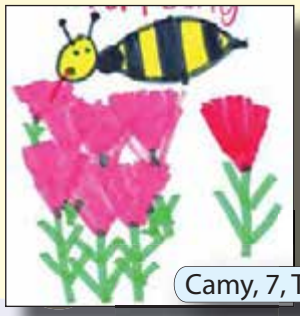
Genus: Now we are getting into even smaller groups. Honey bees belong to the genus *Apis*. The genus is the first part of the scientific name of a species.

Species: Finally we've reached the scientific name for honey bees - *Apis mellifera* (genus/species). We can even take it down to smaller groups. Honey bee stock, which are mixtures of different subspecies, include Italian, Carniolan, Caucasian or Africanized bees.

Italian-3, Carniolan-1, African-5, Caucasian – 2, German -4

ooo Bee kid's corner

Produced by Kim Lehman -www.kim.lehman.com
www.beeculture.com
October 2019


Camy, 7, TX


Anasta, 8, TX

Why did the bee cross the road?
Just bee-cause!
Carys Jones, 8, NC

Latin Match Up

Match the common names of these different kind of honey bees to their scientific name. Some are easy. Others you will need to make a guess.

1.Apis mellifera carnica	Italian
2.Apis mellifera caucasica	Carniolan
3.Apis mellifera ligustica	Africanized
4.Apis mellifera mellifera	Caucasian
5.Apis mellifera scutellata	German or black bees


Carniolan Bees
www.bshoneybees.co.uk

Apis Word Search

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

AFRICANIZED
BUCKFAST
CARNIOLAN
CAUCASIAN
FERAL
GERMAN
ITALIAN
MINNESOTA HYGIENIC
NEW WORLD CARNIOLAN
RUSSIAN

(The solution is somewhere in this magazine.)

Honey Bee Classification

- Kingdom: Animalia
- Phylum: Arthropoda
- Class: Insecta
- Order: Hymenoptera
- Family: Apidae
- Genus: Apis
- Species: Apis mellifera

Humans

Humans belong to the phylum Chordata which is divided into the classes: amphibians, birds, mammals, reptiles and fish.

It's All Latin to Me

The genus *Apis* is Latin for "bee". The species, *mellifera* is also Latin (melli-"honey" and ferre "to bear").

E-mail your artwork to us at beebuddiesclub@gmail.com

Beecome a Bee Buddy

Send two self addressed stamped envelopes and the following information to: Bee Buddies, PO Box 1693, Bastrop, TX 78602.

Name
Address
Age
Birthday Month
E-mail (optional)

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

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

Beekeeping In The Land Of The Midnight Sun

Frank **Mortimer**

SWEDISH BEEKEEPERS

This past June I traveled to Sweden for a family vacation, and while I was there I did what any obsessed beekeeper would do; I spent time with Swedish beekeepers, (*Svenska biodlare*). Until my trip, all of my beekeeping experience had been in Northern New Jersey and I was curious to learn how they keep bees in another part of the world where the climate was so different from New Jersey.

Sweden is about the size of California and most of the people and the largest cities are located in the southern half of the country. My wife is from Örebro, which is smack in the middle of the bottom half of Sweden, about two hours between Stockholm and Gothenburg.

Before heading over, I had emailed Thomas Claesson, the president of the Örebro Beekeepers Association (*Örebro Biodlarförening*). He arranged for me to visit his operation and to attend their club's weekly meet-ups. Thomas is a sideliner, running about 30 hives and raising his own queens. He produces around 3,300 pounds (1,500 kg) of honey a year, which he sells locally to support his beekeeping activities and bring in extra income.

The Örebro beekeeping club owns its own building/club house that sits in a local park. Additionally, they have an apiary within the park where they keep club hives and also some members' hives. During the Spring and Summer, they have weekly meetings where members can show up and help out with the hives. The club also holds classes at the apiary, and uses the space to show anyone who is thinking about getting into beekeeping what it's like to have bees.

Having their own meeting space and club apiary has been a great way for them to attract new members. It's a great teaching venue and a nice place to *Fika* with fellow beekeepers. "*Fika*" is a Swedish custom that best translates as socializing over coffee and snacks with friends, family, or co-workers. It's one of the most Swedish things you can do, which is why per capita, Sweden is the world's second largest consumer of coffee.

LIFE OF A SWEDISH BEE

The most common type of bee in Sweden is the Carniolan. It's the bee of choice because it overwinters so well and is very easy to handle. I was amazed to learn that Swedes overwinter their bees in just one deep box even though their winters are a lot longer and colder than those in New Jersey. Swedish bees require less food stores than colonies overwintered back in the U.S., where according to the Cornell University Beekeeping Calendar for the Northeast, a full-sized colony should have at least 70-90 pounds of honey to eat by the beginning of October. In September, and after they've pulled their remaining honey supers, the Örebro beekeepers put 16 kg buckets of 3-1 syrup on their hives – and that's it.

This means that Swedish hives have less than 40 pounds of sugar syrup and honey stores as they go into a long, Swedish Winter. When I told Thomas that starting in December, we pop open our hive tops (*yttertak*) to check and see if our bees need to be fed, he said it is too cold for them to open their hives and the Swedes will not open them nor start feeding until March, when they will feed their bees with sugar candy, as it's still too cold to feed them sugar syrup.

During the Swedish Summer there are only about four hours of darkness so the bees are potentially flying almost 20 hours a day. This worked out well for my visit, as I met with everyone after their workday had ended and we never had to worry about running out of sunlight. It was amazing to be working a hive when it felt like late afternoon, but was actually past 9:00 pm at night. While the Summers are great, everything is the reverse in the Winter. A Winter in Örebro, Sweden typically lasts from November through March, but it can still snow as early as September and as late as May. During the middle of Winter, the sun is only out from about 9:00 am to 2:00 pm, which is why Swedes are so fond of lighting lots of candles through the Winter months.

NOT QUITE THE SAME IN SWEDEN

One of the biggest differences between keeping bees in the U.S. and Sweden, and perhaps the most confusing, is that in Sweden they have many different sized frames and boxes. The most common size is called, *Lågnormal*, and the most traditional (oldest) size is called, *Svea*. The beekeeping catalogs carry all the sizes, *Lågnormal* (366mm x 222mm), *Svea* (300mm x 300mm), *Norsk* (365mm x 260mm), *LS* (366mm x 300mm), *Langstroth* (448mm x 232mm), and *Dadant* (448mm x 286mm). Also, instead of having self-spacing shoulders/end pieces, their frames use pegs (*avståndshållare*) secured in the top bars of the frames to maintain bee space. From my observation, the advantage of using the pegs is that the frames don't get as cemented together with propolis, and they are easier to remove than our frames in the U.S. Swedish beehives, (*bikupor*) are also available in different sizes and materials, such as solid wood, polystyrene foam, and wood sandwiched together with insulation filling the inside cavity.

Since the topic of wrapping hives in the Winter is heatedly debated in my club, I asked Thomas what the standard practice was in Sweden. He replied that some people wrap their hives, and others do not, which made me realize that beekeepers the world over are more similar than not.

***VARROA* IN SWEDEN**

The Swedish *Varroa* treatment of choice is oxalic acid and sugar syrup using the dribble method, (*oxalsyra*

droppmetod), and they almost exclusively treat in the Fall. It was interesting to note that even though Sweden has a colder climate than most of the U.S., they were not concerned about getting their bees wet during the Fall's colder temperatures. The optimum temperature for when they like to treat their hives is between 0°C – 5°C (32°F – 41°F).

ApiVar is not legal to use in Sweden, and no one with whom I spoke was familiar with it. They also use thymol and formic acid, but oxalic acid is by far the primary treatment for Swedish beekeepers. If they use formic acid, they use it in liquid form, (*flytande myrsyra*), putting it in their hives for just a few days. Some beekeepers make their own thymol crystals as a DIY alternative to buying Apiguard.

The majority of beekeepers treat for mites only once a year, in the Fall after they've pulled their honey supers and before winter sets in. Very few Swedes use a screened bottom board, but the majority of them do use drone brood removal, (*drönarutskärning*), as a management practice to help control *Varroa*.

The most interesting fact that I learned was that there are areas in Sweden without *Varroa* mites! Northern Sweden, which is around and above the Arctic Circle is currently mite free, as are some of Sweden's archipelago and a few of their islands.

In order to try to control *Varroa* from spreading, Sweden is divided into *Varroa* zones and it has strict laws about moving bees between zones. For example, you are not permitted to move bees from Southern Sweden to the North, but you can freely move bees from the North to the South.

SWEDISH HONEY

Even though the summers are shorter in Sweden, their average honey production per hive is similar to those in the Northeastern U.S., which is mostly due to the added hours of sunlight that allow the bees to fly for more hours each day. The Swedish word for "Honey Super" is, "*Skattlåda*" and it translates as "Treasure Box," making *Skattlåda* the best word in the Swedish beekeeping vocabulary.

Thomas likes to harvest three times a year; Spring, mid-Summer, and late Summer/early Fall, as he gets three distinct nectar flows. Just like in the U.S., many of Thomas's customers buy his honey to help with seasonal allergies, and they appreciate the three seasonal varieties, as they believe that each honey harvest better corresponds to whatever is ailing them in that season.

Thomas labels his early Spring honey as dandelion honey, (*maskros honung*). In late Summer/early Fall, the primary nectar flow is from heather, which he said is very thick with a jelly-like consistency, making it difficult to extract and remove from the comb.

Swedes primarily consume crystallized/solid honey instead of liquid. I was told that many consumers are suspicious of liquid honey, believing it is not pure honey, but some sort of adulterated sugar syrup. They do not use the Dyce method to make creamed honey, so some of their solid honey can be harder than we are used to with our creamed honey in the U.S., and their honey does seem to vary in consistency from batch to batch.

Most importantly, Swedish Honey (*Svensk Honung*) is delicious! The honey I sampled was smooth and sweet, with lots of fruity and floral flavors.

Sweden is moving towards becoming a cashless

The Svea hive that the Svea frames fit into. It ws built in 1925 and is still in use.

Note the pegs used to maintain bee space (and how propolis free the ends of the frame are).

The Svea Sized Frame. Note that it is much longer than the frames used in the U.S.

Swedish Roadside Honey sales. Note the scan codes to pay with your phone.

society and several phone apps are in wide use for people to easily e-transfer funds to one another. In the beekeeping world, Sweden, just like in the U.S., uses roadside stands that rely on the honor system to sell honey. You can use your phone to pay for your honey, making it easier for customers to buy as much honey as they want at an unattended booth. The going rate for a 500 g (1.1 lbs.) jar of honey is 75kr ($8.50 USD), which by U.S. standards is a good price to get for your honey, especially at a roadside stand on a country road.

One of the things that I enjoyed the most about my trip was that even though I was on another continent and meeting new people for the first time, we all shared something in common; our love for the honey bee. Thomas and I hope to see one another again, and we will continue to share and compare beekeeping stories.

Many of the club members didn't speak English, yet when we were gathered around one of their hives it didn't matter. We were focused on what was happening inside the hive, trying to see eggs and larvae, confirming there weren't any diseases or pests, and estimating the weight of all the honey the bees had made. The relationship that humans and honey bees have shared for thousands of years transcends arbitrary drawn boarders and all of man's many different languages. My time with the Swedish beekeepers taught me that beekeeping is a strong bond shared internationally, and it's shared among people who have just one thing in common: a love for the honey-making bug. BC

Lessons From Kenya

Bill **Hesbach**

The allure of any country resides like a fabric that's woven into its people. All over Kenya, it can be witnessed with warm greetings, and on the smiling faces of young children. Kenya will welcome you, over and over, until you begin to embrace the people and their environment with reverence and admiration. Such was the case on our recent beekeeping trip – a trip that was a combination of natural wonder, bees, elephants and much more.

We were part of a 10-day tour of Kenya's beautiful countryside with arranged stops at local beekeeping operations. The trip was organized in the U.S. by Maryann Frazier, Penn State Senior Extension Associate, now retired, and in-country by Dr. Elliud Muli, Senior Lecturer in Entomology, South Eastern Kenya University, along with a talented local beekeeping technician from the International Center for Insect Physiology and Ecology named Joesph Kilonzo.

The advantage of having in-country experts became immediately evident as they began to negotiate the terrain, guide us to local beekeepers, and help translate the local dialect. All of which would be near impossible without them. They embodied the Kenyan tradition of firm handshakes, warm smiles, and joy as they shared their country with enthusiastic pride – it was infectious and comforting.

The Journey

The trip was a combination of travel around the countryside, wildlife tours, and interaction with local beekeepers. I'll focus on the beekeeping, but the non-bee stops which included safari tours, a visit to local woodcarvers, a rope-bridge walk across the canopy of a mangrove swamp, and local town adventures equaled the experience with the bees.

We headed north from Nairobi, paused for a brief photo op at an equator monument just northwest of Mt Kenya and then spent our first night in the cool highlands of Aberdare National Park. We then turned south traveling long distances across the savanna to the centrally located town of Mwingi, a town characterized by the rhythms and customs of local Kenyan life.

From there we headed further south to the town of Voi and the Tsavo East National Park where we met the famous red elephants of Tsavo. We ended in Mombasa the ancient port of entry and the location where the world first met Kenya. In Mombasa, we hit the brakes and had a chance to experience the dry prevailing Kaskazi winds from the Persian Coast while we bathed in warm waters of the Indian Ocean. Along the way, we passed highland slopes covered with vast expanses of tea plants and many kilometers of roadside fields with crops of agave and corn.

Beekeeping

The first thing you learn about Kenyan beekeeping is the extent to which the beekeepers can keep bees without intensive in-hive bee management. Honey production is their goal, and its collection is a large part of their interactions with bees. Kenyan's use traditional Langstroth boxes, log hives, and Kenyan top-bar hives. Sometimes during collection from Langstroth boxes, beekeepers provisioned new frames or repositioned old frames to encourage more honey production. But in log hives, it's a simple matter of cutting out honeycombs and closing it back up leaving comb reconstruction to the bees. The only other apiary related task I noticed was some feeders used during the dry season to discourage absconding.

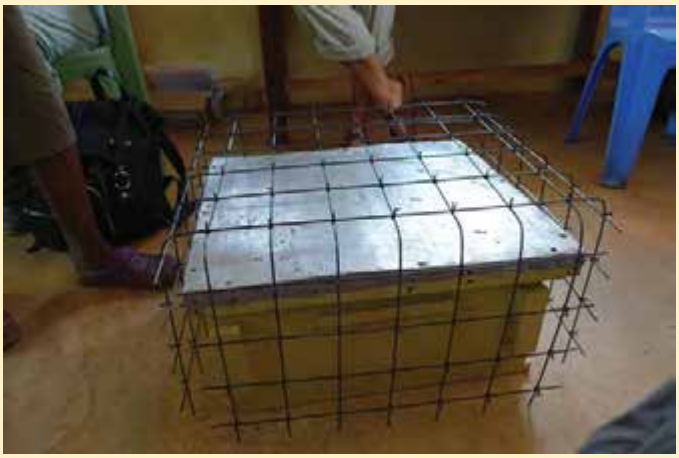
The initial effort is the provisioning of hive space for swarms to occupy. All you need do is provide some adequate space, and with time and the right application of a propolis mixture, the bees come and occupy the hive. Since bees self-populate these hives, there was no talk of an organized package bee industry and only a passing reference that beekeepers collect swarms that happen to bivouac.

Some Kenyan bee farmers consider beekeeping a zero management business especially when they compare the care needed for their crops and other livestock. Just take a moment and reflect on the difference between a zero management approach and the intensity in which colonies are managed in the U.S. The idea that bees can be kept with minimal management prompted the question "why is there such a difference" and our group engaged in a few discussions where we tried to define some lessons we could learn from the Kenyan experience.

While in-hive management is minimal when compared to our beekeeping practices, Kenyan beekeeping has some unique challenges both in terms of hive predation and the environment.

The Red Elephants of Tsavo. (photo courtesy of Geoff Marcy)

Honey Badgers can eat through a top cover.



Honey Badger cages like these help beekeepers combat colony loss.

Their colonies are subject to being devoured by the infamous African Honey Badger, a ferocious weasel-like native that can eat through the metal and wood of a hive cover and then proceed to destroy a colony. The honey badger is always a topic of discussion and drives some defensive behaviors by beekeepers. None is more evident than the practice of hanging all their different hive types in trees. In particular, log hives that are hung high in trees and balanced precariously using a specially shaped wooden stick that allows the log to tip under the weight of a badger making it almost impossible for them to gain purchase.

Another anti-badger strategy, for Langstroth boxes, is to build a cage around the hive. We were introduced to this method when we visited Dr. Lucy King's award-winning Elephants and Bees Project that uses bee fences to protect local crops from the destructive effect of marauding elephants. An elephant can destroy a farmer's field in the matter of one evening.

Dr. King devised a way to hang bee colonies on a wire perimeter around a farmer's field. When the elephants come to eat the crop, they must first engage the fence, and since the colonies are hanging freely, they are nudged into alarm. You can guess what happens next – the bees come out and sting the elephants. It turns out elephants naturally avoid bee colonies because they have many tender places to get strung and bees know them all. Elephants also have a great memory and language to communicate the presence of bees. Dr. King's effort seems to be working, but there are still some challenges. Farmers must first learn to keep bees, and new beekeepers in Kenya are no different than new beekeepers in the U.S. – there's a steep learning curve. (1)

Additional predation comes from small hive beetles, African large hive beetles, *Varroa*, ants, and wax moth to name a few. In our discussions with beekeepers, it wasn't clear what actions they take, if any, against these forms of predation. We saw many large hive beetles in one colony and in that same apiary, there was a colony with a sizable population of small hive beetles. Also, during our visit to The Elephants and Bees Project, we were engaged in a discussion about dealing with wax moth damage – an issue they were experiencing after a colony weakens or absconds and leaves their comb behind. Wax moth in Africa is a full-time threat much the same as it is in warmer parts of the U.S.

The environment is also a consideration. Kenyan's discuss their weather as having two recognizable seasons – dry and wet. The onshore monsoon winds from the Indian Ocean are a significant factor contributing to the rainy and dry seasons. The contrast can be striking from year to year, and like anywhere, beekeeping and honey production follow the pattern of seasons. We were there during January, which is usually the heart of a season when the savanna dries to a crisp brown, and the rains are gone. Just before our arrival, the countryside received some welcome rain prolonging the green season. As a result, the colonies were still bringing in some resources, and a bit of honey was being harvested.

Log Hives

Log hives are used by more than 90 percent of Kenyan beekeepers due to low cost and because they are incredibly durable. There's also a discussion that they provide a more suitable habitat because their rough-hewn interior encourages bees to lay down a thick coating of propolis adding a significant antimicrobial barrier. Propolis may be responsible for lower parasite and pathogen loads, resulting in healthier bees and increased honey production. (2)

We spent the better part of a day with a talented craftsman beekeeper named Mulwa Mbithi, a beekeeper in Ukasi–Mwingi who makes and uses log hives. Mulwa began a demonstration of how he makes a log hive by welcoming us to his home. He cares for seven children and pays for their schooling from the proceeds of honey

African Large Hive Beetle.

sales. His Swahili was translated, but his humor and respectful gestures spoke universally.

Mulwa explained that he doesn't cut down live trees and selects only the dead wood from the common Mutanga tree. Mutanga is considered a hardwood and is also used by Kenyan carvers when crafting decorative table utensils and animal sculptures. Mulwa explained that when a Mutanga log is hollowed out correctly, the hive will last 40 to 50 years.

He gouges out the inside wood with muscle power using a special long-handled chisel-like tool. The tool has a half-moon shaped thick metal end that needs occasional sharpening, accomplished with a few quick passes on a nearby honing stone. In a good season, a log hive can produce about 15 kg (about 33lbs) of crushed honey that is sold to a traveling middleman. Comb honey is also sold from log hives but sells for half as much. In Kenya, the price of a beekeeper's honey is based on their labor to collect and process it. And if you think honey harvesting with our tools and extractors is messy and labor-intensive, consider the following.

Log hives are almost always high up in trees, so when harvesting one must be adept at balance and respectful of both the bees and gravity. To start, Mulwa climbed the tree dressed in a full bee suit, while carrying a rope used to lower the colony. The climb we witnessed was an arduous negotiation of tangling branches accented with equipment hang-ups that impeded progress - it took some time to even get to the colony.

Once at the colony, the fun started while Mulwa tied a rope around the middle and begin to lift it off the branch. As you may imagine, bees don't like any of this badger-like behavior, and they come out for a visit. Lifting the log is not that easy since it can be cumbersome and the beekeeper needs to find a suitable branch at just the right height that's able to carry his weight and the weight of the colony - misjudge that, and you may find yourself on the ground sooner than you intended. Also, Mulwa demonstrated this during the day, but he generally starts harvesting at late dusk and continues into the night. He explained that he tapes a flashlight to his head and will often work the harvest without his hood. He brings along a trusted friend to steady the rope and help lower the colony once it's clear of obstructions. I witnessed the entire process thinking I could not be a log hive beekeeper in Kenya during the day let alone at night with a flashlight taped to my head. Someone asked if the light attracted bees, he said yes, but it's not a problem.

In log hives, bees build natural comb and coat the entire inside surface.

High in a tree, Mulwa jockeys for position before lowering the log hive.

Log hives are hand-hewn with a special long-handled chisel.

Beekeepers harvest at night in Kenya to avoid a defensive frenzy that could escalate into attacks on local area businesses and schools if done during the day. While we did not experience any such defensiveness, I was warned not to judge the behavior of all African bees based on the sample we saw- they can be harmful and even deadly.

The Forest Bees

North of Mombasa along the Indian Ocean coastline we traveled deep into the Arabuko-Sokoke Forest to visit the legendary beekeeper and conservationist, Alice Kasika Mwiu also known affectionately as Mama Kasika. We followed a red-dust road into the heart of the forest that at times had ruts that could have easily tipped our caravan over but we had a skilled and fearless driver who proved his expertise many times during our journey.

On arrival, Mama Kasika welcomed us warmly at her farm gate, and then directed us to a sheltered greet-

ing area for proper introductions. Mama has about two hundred hives that in a good year are capable of producing two tons of hand-processed honey. She keeps every variety of hive type typical in Kenya with the addition of an innovative mud hive. She keeps both stingless bees, and *A. mellifera litorea*, which is commonly known as the coastal bee.

Stingless bees

There are about eight hundred species of stingless bees worldwide of which a handful have been identified in Kenya. The two types we saw on the coast likely represent the *Hypotrigona gribodoi*, which are hardly visible at about 2mm in length (that's about two-thirds the size of a fruit fly), and the easily seen *Meliponula ferruginea* which is approximately 7mm long, or about the same size of a house fly. (3) They are known to occupy almost any hive type available and are naturally resident in small hollow tree branches.

The smaller species were kept in a box about one half the size of a shoebox with a solid top cover and an eighth-inch tube for an entrance. The bees glue it shut, and inside they separate the brood area from the pollen stores and honey using a wax and propolis divider. We also observed many hives made from small hollow branches hung on a wire reminiscent of a sculpture garden.

It's known that stingless bees are excellent pollinators and their honey, which is often syringe-extracted one cell at a time, is very sweet. While observing stingless bees, you enter a miniaturized version of beekeeping with some interesting differences. Stingless bees are not entirely defenseless, and some species will defend their colony by biting. They have many predators including ants, robber flies, lizards, and humans. The ones we saw were docile and seemed fragile due to their size, but they were thriving. The reason they're stingless is not well known, but the adaptation must have had advantages.

Stingless bees don't have open brood but instead lay eggs on a food mass then cap the cell during metamorphosis. (Figure 9) It takes about 35 days for a stingless worker to emerge and approximately 32 days for drones. They are both reared in the same size cell, so when observing brood, the caste wasn't evident. (5)

The queens are not polyandrous and only mate once during a single mating session. Also, their swarm behavior is entirely different than *Apis* in that the colony first finds and establishes a new nest site and populates it with hundreds of drones. Then a virgin queen and many workers leave the mother colony and head for the new location. In time, the virgin initiates her mating pursued by a drone comet, and a single mating takes place. It's risky and dangerous, and queens can die, so the mother colony and the new colony maintain a relationship where backup virgins are supplied if needed until the new colony is queen-right. (3) This backup supply of virgin queens has been observed to last up to six months. They've been doing it this way for millions of years, so it works well. African bees are made up of ancient races that have naturally evolved into ecotypes suited explicitly for their local environment.

Stingless bee brood is always capped.

Another interesting adaptation is that stingless bees' wax glands are on their dorsal side which is the opposite of Apis. Apis mellifera can use their legs to harvest wax scales off their abdominal glands, then transfer the scales to their mandibles for comb construction. When stingless bees make wax, other bees groom the scales off and place them in a collection area near the brood nest that's dedicated as a pure wax depot. Also, near that same area, is a collection site for the propolis they have collected. During comb construction, stingless bees mix wax and propolis into what's called cerumen – the common name for earwax in mammals. Cerumen is used for comb construction and sealing the colony, or for repairs. (3)

The cerumen is dark brown, real gummy and used all over the nest cavity making opening their hive box a challenge. It tastes a lot like you might imagine – chewy and distinctly recognizable as a hive product – I couldn't resist a sample.

Mixing wax and propolis seems like a winning combination. We know propolis has antimicrobial properties and has been used for hundreds of years by people as a medicinal product, and wax has the strength and plasticity to facilitate comb and habitat construction.

While *Meliponini* uses propolis and wax as a mixture, *A. mellifera* separates wax and propolis into distinct uses, while *A. cerana*, the Asian honey bee, doesn't use propolis at all. You may be asking why, but evolution doesn't yield to our expectations nor can the result be simply explained. The best we can do is observe and learn.

Mud Hives

In other parts of Mama's apiary, there were a variety of different hive types, and one unique hive body made of mud. Mud is a building material used in Kenya for homes, small buildings, and in this apiary, for beehives. Since wood is scarce and expensive, using mud to build is a great option. In this yard, mud took the shape of a European long hive providing space for about 20 top bars, and the hive's considerable weight must mean that its location remains stationary after construction.

A downside to building with mud is that it will "melt" under prolonged exposure to rain, so these colonies were kept in an open shed, and some others in a more protected building. It's not clear that a mud hive body has any biological advantages, but it certainly has both ecological and economic benefits.

Langstroth Hives

Some beekeepers use standard Langstroth boxes,

Mud hive painted white.

but their high cost and low construction quality make them an unfavorable choice especially for rural beekeepers. Although Langstroth boxes are not as popular, they are the most effective style in terms of their attractiveness to swarms which is a significant consideration given that, in Kenya, swarms are how you get bees. (2)

As we know, while using a standard sized brood box the queen will lay brood over most of a 10-frame deep, and since African queens are known to lay out to the edge of frames, the addition of a vertically stacked honey super is required for an ample harvest.

Having observed that most honey supers were only partially filled, Dr. Muli introduced an alternative configuration that lengthens a standard box to include about five additional frames. Muli's extended box allows for brood production and honey harvest from a single box. A queen excluder placed in the box at around frame nine or ten keeps the queen confined to the designated brood area. Muli's box accomplishes a few critical objectives. First, it conserves wood. Second, it cuts down on the cost of inventory making a Langstroth style box more affordable, and finally, it's easier to hang one single box in a tree when trying to avoid predation from honey badgers.

Kenyan Top Bar Hives

We saw Kenyan TBHs in many places during our journey. Unfortunately, we didn't get a chance to open one, but my guess is they work fine with the exception that swarms do not readily accept them. In a 2017 study, Langstroth, log hives, and TBH's were compared to determine which ones are more attractive to swarms. (2) After placement of the colonies, occupation percentages were monitored for 140 days. During that period, swarms began to move in, and the results showed that Langstroth boxes were occupied at a higher rate and at the end where 100% occupied. Next highest were log hives that ended up 80% occupied but filled slower than

Elephant fence using posts that sprout into trees.

Langstroth boxes. The last place was Kenyan TBHs that reached about a 16% fill even when at day 130 it was the height of swarm season.

The other downside to Kenyan TBHs is the amount of wood required to build them. Wood is a precious commodity and protected by local conservationists. So some TBHs are made from plywood, but that's an expensive and impractical alternative for most rural beekeepers.

Wood conservation became an issue at Dr. Kings Elephants and Bees Project because of concerns that their fences would encourage a level of deforestation from harvesting wooden post material. Their solution was to suggest the use of a species of Comiphorer tree that when allowed to rest a few days after cutting, and placed in a dug hole will sprout and leaf out. The replanted post will root and grow back into a tree. They are thus providing maintenance free, shade-producing, bio-fence instead of a lineup of dead fence posts.

Honey Collection

Most of the honey collection and processing was crushed comb with some basic straining. The end product was a combination of wax and honey, and maybe a few bee parts, leaving the remainder of the supply chain to process it further.

Mama Kasika's operation had a hand crank extractor that she shared with other beekeepers in the area. Since all combs in Kenya are foundationless, there are no reinforcement wires, so Mama fabricated unique

Mama Kasika and her special extraction frame.

wire baskets that are sandwiched around the frame during spinning to prevent combs from flying apart.

Lessons From Kenya

The one thing we knew going in is that African bees have had millions of years to adapt and evolve, so the subspecies we observed are real ecotypes – a kind of local bee we all wish we had. Another lesson is that Kenyan bees are not manipulated, or artificially bred to eliminate traits like propolis collection. There are no specially bred queens, or package bees to be had, they don't truck bees thousands of miles to pollinate crops, and yes, they are treatment free. The list goes on for so long that you suddenly realize that any comparison between our bees and African bees is futile. Behaviors and disease pathologies don't easily translate across the expanse of our different environments and genetics.

For example, when *Varroa* first started to ravage colonies in South Africa, it only took five or six years before their tolerance or resistance made *Varroa* a non-issue. (6) In Kenya, *Varroa* were first identified in 2009. (7) Today in Kenya, *Varroa* are not considered a devastating parasite and beekeepers don't monitor their populations. When you ask the Kenyan beekeepers what they did to help their bees adapt to Varroa, they say "absolutely nothing." Learning more about how Kenyan bees adapted may be helpful to all bee species worldwide. A question may be, what was it about the environment that helped Kenyan bees and is there an accompanying genetic component. More fieldwork may be helpful.

If it's the case that Kenyan bees tolerate pests and diseases better than European bees, it may be worth looking at the simple fact that they use more of the powerful antimicrobial, propolis. Propolis collection is a colony's practice of social immunity. To breed out its use, as we have tried to do in the U.S., denies a colony of a critical part of their defense. (4)

The Ride Back Home

At the end of every day, we would find ourselves with a long ride back home. During those times our Kenyan counterparts would gather around our driver and Swahili filled the air. There was always lots of laughter, handshaking, shoulder slapping and everything we had come to know as the warmth and joy in our Kenyan companions. Jim Frazier said it best "A truly unique signature of what they share with us each day. I recall it often!"

There's another ride home that extends the journey far into the time after you leave Kenya. The elephants kick up enough red dust to color their bodies, and no matter how much you resist, some of what's left will fall on you. You cannot wash it off completely – it lingers in your dreams, you drink it with your morning tea, and it calls you back. Kenya finds its way inside you, and you will cherish it. I recommend the journey. BC

If you are interested in participating in a future beekeepers' tour of Kenya, contact Maryann Frazier at ***maryann.frazier15@gmail.com***

Thanks to my wife Elizabeth who accompanied me and always supports my pursuit of beekeeping. Also, thanks to all who traveled on this journey – you made the time we spent together enjoyable and entertaining.

Bill Hesbach owns and operates Wing Dance Apiary in Cheshire CT. He's an Eastern Apicultural Society Certified Master Beekeeper and a graduate of the University of Montana's master beekeeping program. His articles on beekeeping are available in Bee Culture, Bee Craft *and* The American Bee Journal.

Endnotes

1-You can learn much more about this fascinating eco-friendly approach, and you can even volunteer. Just search The Elephants and Bees Project online.

2-The impact of hive type on the behavior and health of honey bee colonies (Apis mellifera) in Kenya Alexander McMenamin et al.

3-The biology of the Stingless Bee Trigonu (Hypotrigona) gribodoi Magretti (Meliponidae) Bassindale, R & Harrison Matthews, L. (2009).

4-Propolis Counteracts Some Threats to Honey Bee Health Michael Simone-Finstrom, Renata S. Borba, Michael Wilson, and Marla Spivak.

5-Stingless Bee Nesting Biology David W. Rubik Smithsonian Tropical Research Institute, December 2005

6- Analysis of Varroa destructor infestation of southern African honey bee populations. MS Dissertation MS Dissertation. University of Pretoria. Pretoria

7- Evaluation of the Distribution and Impacts of Parasites, Pathogens, and Pesticides on Honey Bee (Apis mellifera) Populations in East Africa Elliud Muli, Harland Patch3, Maryann Frazier, James Frazier, et al.

Power Points

Power Point presentations appeared back in 1990 and rather quickly replaced the photographed slides. At that time quite a few books were on the market about how to make a Power Point presentation. Some presentations then were excellent but many were not good at all for various reasons.

Jump forward to today, 2019, and we have Power Points but the books have essentially disappeared. All sorts of information is now to be found online. Have presentations – still called slide shows – improved? No. For a variety of reasons.

Instead of just barreling ahead with your great idea for a dramatic and educational Power Point – stop for a minute and think. There are many aspects of making a Power Point. Let's have a look at them. You may wish to go back and revise some of your presentations. Let's call it "updating."

First of all you are going to consider you and your computer or laptop. Nobody thinks about what you see because it's just the way we live with it. **The light is coming from behind the screen to your eyes. Backlit.** Colors look brilliant; some seem to glow; words are easy to read. That is how these screens are designed. You are used to the way colors and words look. Here is where you will be preparing your Power Point.

Now you are off to a meeting. Either your laptop will be taken with you or you will have put the talk on a thumb drive (flash drive, stick) and hope the information is compatible with the equipment at the meeting. If all is well, your Power Point will be projected onto a screen. The lighting has reversed. **The light from those slides is bouncing from the screen to your eyes – frontlit.**

Now the view of your Power Point is definitely different. Those glowing reds and golds no longer glow. Pale blue and green backgrounds have disappeared into a sort of greyish color. You had chosen one slide to have a black background with fiery red letters. Well, you still have the black background but the red letters are just not dramatic now. In fact some are hard to read. But black letters on a white background appear normal and easy to read. You really wanted to have some dramatic effects with colors, but the view will change when shown on a screen.

Will a projection screen always be available for your presentations? That depends on the venue. A very large meeting room may actually have two good screens, depending on the shape of the room. If you are speaking to small local clubs, you may or may not have a screen. If not, your Power Point may have to be shown on a wall. Not every wall is painted white. Some may be beige, pale green or sort of a creamy color. Yes, your slides will look weird, especially if you used an assortment of colors.

If you know in advance that the wall color is going to affect the colors you chose for your slides, you can always make a duplicate of the presentation on a white background and change to black letters. It may not have the dramatic effect you hoped for, but at least the information is visible. Remember, your audience came to learn something. Having that duplicate means you can give your presentation anywhere.

Do you have a projector? Owning one would definitely help in designing and reviewing your presentation. The selection of projectors, as well as the price range, is huge. If you will be designing and giving many Power Points a projector would give you the opportunity to view them yourself while composing them. Yes, you may be showing them on a wall of your home. That is a good test of how they will appear at a small venue.

Another advantage in owning a projector is that it gives you the opportunity for presentations to small groups, such as local clubs that do not have access to equipment. Yes, you will have to bring your laptop, projector and the cables. Find a cheap, small suitcase with wheels. It would be nice if it has some compartments inside. Then pack your laptop, projector and cables inside and go! It is wise to include a long extension cord with a multiple plug-in end. It could be the essential piece at small club venues.

Fortunately today most equipment, laptops and projectors, do "speak" to each other, whether they are in a large meeting venue or on a meeting organizer's equipment. If you will be flying to the meeting you can put your presentation on a stick and mail it in advance asking that it be tried on the equipment beforehand. Don't forget to take one yourself to the meeting in case the one you sent gets misplaced. If your Power Point is loaded onto the venue's laptop, be certain it gets deleted before you leave the venue. They usually are, but just make sure. It is yours.

To make sure you have a copy of your presentation, bring *TWO* jump drives with the program on it, and, dump the program into a file sending outlet like Dropbox, and send the link to the program Chair. That way, you have it, they have it, and mismatched equipment doesn't get in the way.

There is one more thing to consider about the meeting place. Large organizations will meet at hotels or conference centers. Some seemed to be planned sensibly; others are incredibly poorly designed. There is the narrow and long audience seating. The front row of the audience may be 50 feet from the projection screen up on a stage. The last row

can be 150 feet or many more away. For someone sitting near the back, whatever appears on the screen is, for all purposes, invisible – a blur. What you say in your presentation is then more important than what is on your slides.

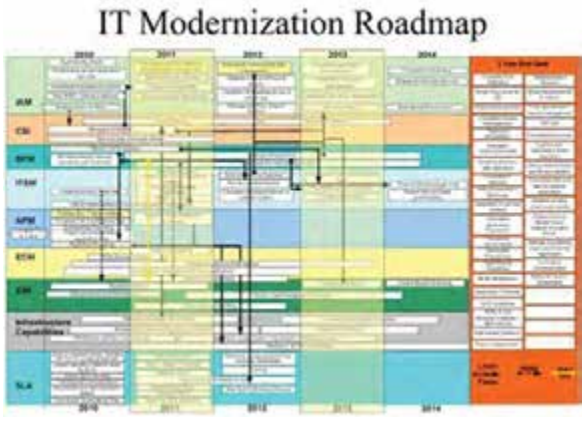
Your audience needs to be considered for several reasons. For a scientific talk addressed so scientists, charts, graphs and scientific terms are really the language of science. Therefore, those are acceptable for that audience. But even charts and graphs present problems when composing those for Power Points. Beekeeping also has its own language. So if your talk is to beekeepers, use those familiar words. However if your Power Point is for non-beekeepers, such as a garden club or a civic organization, beekeeping terms may need to be modified. If the audience sees unfamiliar words on the screen they will be pondering those while you are talking. You've lost your audience.

There are other ways to lose your audience. Let's see what they are as we compose a Power Point. First you need to select the background. You are offered a wide choice, including designing your own. Some choices will not be desirable when frontlit. Now go back for a minute and consider the venue and its associated problems. You can always make your slides with the most simple one – plain white background – and change it later.

Next you need to choose a font style. It needs to be one easy to read, even from a distance. Take a look at some common fonts – Arial, Calibri, Helvetica, Lucida – both in normal and in bold. Next choose a font color. Black is always visible, even when the audience is many feet away from the screen. The font size must be BIG to be visible. The title on a slide can be in all capital letters but the points to follow as text can have capitals and lower case as appropriate. The initial slide (number one) will be the title of your presentation. It can have a picture or some other appropriate decoration.

Power **Point** are the words to keep in mind. Your slides will be showing the points you will be discussing. They give the audience the topic as well as act as a guide for you to stay on track. The points will be simple, only a few words. They can have sub-points. You can have bullets, or not. The Points will have one to a few words per line. The ideal number of lines is three, appearing one at a time, never all at once. Well, if it works better with four lines that would be acceptable – but no more. Make two slides. When something appears on the screen the audience will immediately focus on that. During those seconds the audience is not listening to you – they are reading. If you put everything on at once, you have lost your audience.

Do not get carried away with all the choices for Animation, the term used for how your Points will come onto or perhaps leave the slide. For most slides "Appear" puts your Point on quietly. However you may need to use an occasional different one to emphasize something important. Experiment with some different effects to choose something appropriate. But do not overdo the crazy ones. They can get very tiresome and lose their effect.



A bad slide.

Depending on the topic of your presentation you may wish to add some photos, a drawing, a video, some music to your presentation. Select the photos carefully keeping the venue in mind. Are the photos in focus? Two little bees doing something could look like a blob of something brownish from 75 feet away. If you have a video, please practice opening it many times to do it quickly and smoothly. Fiddling around and muttering to yourself to get it to work means you've lost your audience.

You may wish to use some ClipArt. Some of it is free, some for sale. Use ClipArt where appropriate. It can be photos, cartoons, big or little. If you select something from another source than ClipArt, you must respect copyrights and trademarks. You can use your own photos and drawings but, again, consider the venue for visibility.

Graphs are a problem. The x and y axes are labeled but nobody can read the words. Seven or eight thin colored lines wiggle their way across but this carefully drawn graph conveys little information. If you can limit the lines to two, or maybe three, then some information can be conveyed. Bar charts are much easier to interpret. But not too many bars at once. Yes, the bars need to be in different colors. Different sizes (taller, fatter, longer) can be easier to see also.

Slides that acknowledge or thank a number of people or institutions can be put on one slide with no Animation. This slide can be at the beginning or at the end of the presentation. You can certainly have a final slide. It can say "Thank you" or ask for Questions (if time permits). Or you could end with a photo or something from Clip Art.

If you are speaking at a large meeting in a hotel or conference center you could actually find out what your presentation will look like. You might be able to show it to yourself with the cooperation of a friend. If the meeting room is empty for a time and your Power Point is already loaded, have someone open it and click through a number of slides. You will be sitting halfway back in the room. What do you see – or maybe, what can't you see? From being a "member" of the audience, you will learn a lot about making Power Points.

You will be attending many more meetings, large and small. Now you have the information to watch other Power Points and see the problems. However some will be done correctly and the presentation will be informative. You may find yourself seeking a front row seat in order to see graphs and photos. You will also find out what it's like trying to read a slide with ten items shown all at once while the speaker is talking.

Your Power Point is now completed. You know the time you have been given for your presentation. Set up your laptop and projector at home. It's practice time but your audience is your dog or cat. Don't be disappointed if they sleep through it. If all goes well, you are ready to go! Yes, it's OK to feel a bit smug while thinking about your nicely prepared Power Point. BC

The recent increase in pesticide applications for mosquito control has many beekeepers concerned about the welfare of their colonies. Yet, at the same time, the public is also concerned about being exposed to mosquito borne diseases, which can be life threatening. Add into the mix the widespread media attention about Zika virus, and now people are afraid. And this fear is being fueled with headlines, radio ads and large billboards speckling the roadways with giant mosquitos hovering about with large, bold lettering, "**Only You Can Help Stop the Spread of Zika Virus**, **Call, Kill A Bug Today**!" Because of these concerns, it was time to publish an extension bulletin that would hopefully begin to educate the public, pesticide applicators and beekeepers about key issues we are all facing. My friend and colleague, Elmer Gray and I worked together to write the below UGA extension bulletin. Elmer is a UGA Research Professional IV along with being a mosquito and black fly expert. I must give credit to him since he wrote most of this publication. I only helped with the beekeeping aspect since I know very little about mosquitos, expect for the pain and itch they have inflicted on me over the years. Our intentions are to hopefully bring all parties to the table to open a dialogue. Communication is the key in keeping the public, bees, pollinators and our environment safe. Without it, problems will most certainly continue.

The Intersection of Mosquito Management and Pollinator Protection

Elmer W. **Gray** and Jennifer **Berry**
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Mosquitoes can transmit a wide variety of pathogens and can cause a significant reduction in the quality of life due to their aggressive biting behavior. Pollinators, and honey bees in particular, are a critical part of our natural environment, contributing significantly to food production and ecological diversity. Unfortunately, these two groups of insects often have overlapping habitats. As a result, proponents of both mosquito management and pollinator protection must find a way to communicate and work together for the betterment of both society and these important entities.

Mosquitoes are a significant public health risk due to their disease transmission potential. While West Nile virus is the most common mosquito-borne disease in Georgia, other diseases like Eastern Equine Encephalitis and LaCrosse Encephalitis are also regularly detected. In addition, many areas experience significant nuisance activity associated with pestiferous mosquito populations. As a result, many different techniques are used to suppress mosquito populations. Ideally, mosquito control today is conducted in an Integrated Pest Management based manner. This approach would typically include education, surveillance, source reduction, larviciding, and adulticiding. When conducted properly, scientific studies and repeated operational observations have demonstrated that this approach does not pose a significant risk to honey bee colonies.

That being said, our pollinators are extremely important and seemingly, at risk. Pollination, the process of transferring pollen, is necessary for the production of seeds and fruits in many crops. While many insects such as flies, beetles, moths, butterflies and wasps can be important pollinators, bees outperform them all because of their dietary need for pollen and nectar, their hairy bodies that carry pollen grains easily and their rapid flight from flower to flower. In addition, of all insects considered beneficial, none is more favorably viewed by the public than the western honey bee, *Apis mellifera.*

Ideally, mosquito control today is conducted in an Integreated Pest Management based manner.

Unfortunately, honey bees are facing many challenges. In 2006 beekeepers began to report unusual colony losses throughout the United States. The term Colony Collapse Disorder (CCD) was adopted and over the past decade all aspects of honey bee biology and ecology have been intensively studied. Resulting research has identified many factors that are contributing to the stressors facing honey bees. The most important factors include the non-native, ectoparasitic mite, *Varroa destructor*; viruses spread by *Varroa*; pesticide exposures; and habitat/forage degradation and the resulting poor nutrition from this degradation (http://bees.caes.uga.edu/content/dam/caes-website/departments/entomology/documents/honey-bee-program/PollinatorBookletforWeb2-2016.pdf).

Honey bees, along with other pollinators, are susceptible to pesticides, and significant bee kills have occurred due to mistimed or misguided pesticide applications. These types of events should not occur, and all parties involved must work in a more thoughtful and diligent manner to ensure that they don't. However, in today's society and economy, pesticide applications are conducted in many parts of our environment by a wide range of individuals with varying levels of training and expertise. Commercial pesticide applicators involved in mosquito control activities are required by law to possess a pesticide applicator's license which typically includes pollinator protection training and education. In addition, all pesticide applications are regulated by the pesticide label which now include pollinator awareness specifications. The training and education of all pesticide

applicators is of increasing importance and emphasis for the University of Georgia Cooperative Extension Service.

While all pesticide applicators bear a significant responsibility to minimize pollinator exposure to pesticide applications, beekeepers also have a responsibility to inform applicators about the presence and location of their honey bee colonies. **The importance of this level of communication between both parties cannot be overstated.** Pesticide applicators, and mosquito control districts in particular, cannot avoid honey bee colonies if they are not aware of their presence. Consequently, the best thing a beekeeper can do to protect their hives from mosquito control activities is to be educated about the local mosquito control practices. Areas with organized mosquito control programs provide an operational administration that would serve as the point of contact for both local beekeepers and beekeeping associations/clubs. Communication with the local mosquito control district will provide the best information related to the current mosquito control efforts in the area and how beekeepers can protect their hives and minimize pesticide exposure. In some areas today, the local public health administration is involved in mosquito control activities and would also be another effective point of contact. Most everyone involved in vector and pest management is aware of the concerns about pollinator health and the need for improved levels of communication and diligence.

For mosquito control practitioners, knowing a honey bee colony is present is just part of the equation. Mosquito control is a complex issue. It is conducted in a wide range of habitats and social structures and includes both public health and nuisance aspects. There are usually valid reasons to justify the effort and expense of a mosquito control application. Either surveillance data has identified a significant nuisance population, there is a public health issue due to an identified disease transmission risk, or multiple complaints have been received. No matter the cause, mosquito populations that are building to levels sufficient to warrant a mosquito control application should be targeted in a comprehensive manner. Mosquito control professionals should fully support the use of the Best Management Practices of Integrated Mosquito Management which include a stepwise progression of activities that will suppress a mosquito population in the most efficient manner (**https://extension.uga.edu/publications/detail.html?number=C1154**). Education, surveillance, source reduction and larviciding can all be conducted prior to an adulticide application ever being considered. Education is the foundation that all levels of mosquito control builds upon. Knowledge of the mosquito life history provides a better understanding of how to target the pest populations most effectively using the wide range of techniques that are available.

As part of this educational process, a brief synopsis of mosquito biology would include the following information (**https://extension.uga.edu/publications/detail.html?number=C1155**).

All mosquitoes require standing water for larval and pupal development. Female mosquitoes deposit their eggs on the surface of standing water or in places that later become flooded or filled with water. After the eggs hatch, the larvae develop through four instars. Under ideal conditions of warm temperatures and abundant food (small plants, animals and particles of organic matter)

the larval stage may only require five to six days, but it usually takes longer. After completing the larval stage, pupation occurs. The pupal stage is a period of transition and often requires two to three days before the adult mosquito emerges onto the water's surface. Both male and female mosquitoes feed on nectar and other plant juices to provide energy for flight, but only the female mosquito requires a blood meal to acquire the nutrients needed to stimulate egg production. It is this requirement of a blood meal that causes the mosquito to be our most important arthropod vector.

It is important that the public and mosquito control practitioners have a basic understanding of the mosquito life history and Integrated Mosquito Management (IMM). Homeowners can often reduce mosquito populations around their homes and neighborhoods by being vigilant about eliminating all forms of standing water. Source reduction conducted by eliminating areas of standing water through improved drainage or community cleanups permanently eliminates larval habitats and provides mosquito control with no pesticide applications. Constant vigilance around homes and neighborhoods is required as larval habitats will develop and change over the course of the year. Larval habitats that cannot be eliminated, but have larval mosquito populations present, can be treated with an EPA approved larvicide. A complete listing of approved larvicides can be found in the Georgia Pest Management Handbook. Larviciding is very efficient and effective, but sometimes the larval habitats are expansive, inaccessible or unknown. As a result, adulticiding remains an integral part of IMM. However, adulticide applications should not be conducted until adult mosquito surveillance has detected a pest population present.

Adult mosquito surveillance can be conducted using a variety of techniques (traps, sweep netting, landing rates). What is most important is that a reliable and consistent technique is used to document that a pest population is present. Commercial pest control companies can use a simple sweep net to determine if adult mosquitoes are present in a yard or around common harborage sites like hedges, shrubs, vegetative ground covers, and protected

Calibration of the application is critical to an effective adulticide application.

areas. If no adult mosquitoes are present, an adulticide application is not warranted at the time of evaluation.

At this point, enhanced education, surveillance and source reduction efforts can be conducted thereby adhering to the Best Management Practices of IMM. These practices will reduce pollinator exposure to unnecessary pesticide applications, help to preserve pesticide susceptibility and reduce costs while being environmentally responsible.

If adult mosquitoes are present and an adulticide application is warranted, there are a variety of techniques and products that could be used. Adulticide applications commonly occur in one of three forms, Ultra Low Volume (ULV), thermal fogging, or a residual barrier application. The ULV and thermal applications produce a mist or "fog" of small (10-50 μm) droplets and are representative of the current version of the familiar, long-time mosquito spray truck. Today ULV applications can be conducted from planes, helicopters, trucks, ATVs or handheld devices depending on the size of the area to be treated and the resources of the applicator. Thermal fogging is typically conducted on a smaller scale, either from truck, ATV or by hand. Both of these technologies typically require applications late in the day to the overnight period when meteorological conditions are most conducive to keeping the insecticide droplets closer to the ground where mosquitoes are active. Residual barrier sprays are commonly applied with powered backpack sprayers but can be applied with a manual pump-up sprayer just as effectively. This technique uses a coarser spray to target surfaces where resting or hiding mosquitoes will land. Barrier sprays are typically applied during daylight hours and should be carefully applied to avoid all flowering vegetation. No matter the technique, if an insecticide application is warranted, **THE LABEL IS THE LAW**, and pollinator awareness information is now included on that label.

Calibration of the application equipment is critical to an effective adulticide application. ULV applications are conducted targeting a specific droplet size based on the equipment and pesticide being used. Proper calibration will maximize the effectiveness of an application and thereby help to reduce the number of subsequent applications. The ULV application is conducted such that the mist of pesticide droplets is released into the environment where, and when, the adult mosquito is active. It is imperative that the target pest species is active when the insecticide droplets are present. As a result of most mosquitoes being crepuscular or nocturnal, ULV adulticide applications are typically conducted between dusk and dawn. This is good for pollinators because most applications are conducted after most pollinators have returned to their hives or nests in the late afternoon. It has also been determined that bees are approximately 100 times less susceptible to an appropriately calibrated application of mosquito adulticides than mosquitoes.

While mosquito control personnel work to minimize adulticide applications through the use the Best Management Practices of IMM, the responsibility for the health and welfare of bee colonies rests ultimately with the beekeeper. As a result, there are things beekeepers can do to minimize the risk to their hives as well. In addition to communicating with the local mosquito control authorities, hive placement can be approached in a more deliberate manner. Strategically positioning hives 300 feet or more away from potential truck spray routes can significantly decrease the potential exposure to all ground-based adulticide applications. For situations where hives will be located closer to spray routes, barriers such as fencing, hedges or shrubbery can offer significant protection by reducing the exposure potential. Barriers on two sides are good but three would be even better. Hive openings should be facing away from the potential spray route, again reducing the potential of bees being exposed to mosquito control applications.

When mosquito control notifies of a definite adulticide application, hives can be covered with moist burlap, sheets, hive nets, or any other type of breathable material to keep bees in a hive during the timed application and reducing the potential for pesticide deposition on the hive. By keeping the foragers inside for a short period, it will help to reduce any potential residual pesticide exposure. However, it should be understood that honey bees have the potential to forage up to five miles in search of pollen and nectar and as a result can be exposed to pesticides in many scenarios besides mosquito control applications. This biological trait requires that beekeepers be cognizant of all facets of the environment around their selected colony site location. In general, mosquito control is usually conducted to reduce the potential for

disease transmission and nuisance potential. The less densely populated and area is the less likely it is to have significant mosquito control activity, as a result it is usually best to locate honey bee colonies in rural areas for a variety of reasons.

In summary, both mosquito control practitioners and beekeepers can play a vital role in reducing the risk of pesticide applications to pollinators. Mosquito control should be conducted in an integrated manner adhering to the Best Management Practices. Integrated mosquito management practices would include educating the public on how to prevent and eliminate larval habitats, determining exactly what species is causing nuisance or public health risk and eliminating any available larval habitats. Larval habitats that can't be eliminated through source reduction efforts should be treated with an EPA approved larvicide. If larval habitats cannot be located and eliminated, then an adulticide application may be required. It is at this point that communication and hive placement and care become the most important parts of the intersection of mosquito control and pollinator protection. Beekeepers should know when mosquito spraying is taking place and mosquito control must know where honey bee colonies are located in order to minimize pollinators being exposed unnecessarily. Enhanced training, education and communication should become a routine aspect for both groups in order to reduce the exposure of pollinators to mosquito control applications.

Are You Listening?

NOTES FROM THE BOARD

Apis M. **Mellifera**

On Help From Above

At this time, the Board Of Directors has asked me to communicate its sense of unease about human financial matters. There is much talk about the various methods to restrain inflation and cure other economic maladies in the news. The major regulator of the human economy appears to be government, which in turn controls banks. Throughout history, institutions developed by humans, it would appear, are responsible for rampant monetary and market problems. To we honey bees, this looks very much like our situation when, whether we ask for it or not, we get "help from above."

Routinely we have been fed an abundance of sugar syrup and pollen supplement by our beekeeper in early Spring. We are also jumbled about, as our household is inspected. All this stimulates us to get moving, which often is good for both us and our beekeeper. Our economy, as it were, gets a shot in the arm. We reply by beginning to rear brood. Each of us is better fed than usual this time of year, the temperature in the colony is raised, and young bees become abundant in the expectation of more brood to feed and the honey flow to come.

Because of this stimulation (help from above), however, our food consumption dramatically increases. After all, we must put a lot of reserve investment (honey and stored pollen) into sustaining this economic (population) growth. The concept is this will all be to our advantage when the honey flow begins, for we'll be better able to take advantage of the future nectar to be produced.

As good as we feel now, however, due to this souped-up situation, the board of directors always is somehow uneasy. For even though we're prospering as never before, they know we're running on the ragged edge of disaster. This is a real fear. It happened last year to a colony just down the road. It's beekeeper was informed about the value of feeding bees to stimulate them to make more honey. But after some time, the food supply was discontinued either because funds became scarce or perhaps we bees were forgotten in the rush of daily human activity.

Unfortunately, feeding was stopped just as our sisters were in high gear. The colony's growth, however, continued and the already burgeoning population clamored for more and more food. When it became apparent that none was forthcoming, and to make matters worse, the Spring weather deteriorated into a late snowstorm, brood rearing finally came to a halt. Our sisters were forced into a frenzy of eating excess eggs and larvae to sustain themselves, and the colony's condition continued to decline. The population starved agonizingly and slowly over the next few weeks. The last sister tucked her head into a cell never to draw it out again just as the weather cleared, bringing forth the first few flowers of Spring with their precious nectar.

This is the sad tale of what can happen when we are fed indiscriminately and unthinkingly in the Spring. ➪

Stimulative feeding is a powerful tool, but it is also a two-edged sword that can backfire with tragic results. And it seems to us that those who would manipulate the human economy, whether asked to or not, and believe that all help from above is good, might take a lesson from our experience. This situation can look awfully like a beekeeper who expects something from nothing when managing honey bees.

On Reaching Consensus

The board of directors has again asked me to write concerning something that's been on its mind lately, the subject of brood disease. We abhor brood diseases, especially the dreaded American foulbrood (*Paenibacillus larvae larvae).*

We have seen this plague appear to erupt for no good reason in some of our sisters' hives of late, spreading death to the "unborn" bees of the population and signaling the demise of several colonies by burning at the hands of the bee inspector.

Unfortunately for us, there appears to be little agreement among human scientists, beekeepers, regulatory agencies and others concerning how to deal with American foulbrood. Each state, for example, has a different apicultural law. These run the gamut from little inspection coupled with recommendations to feed antibiotics for prevention and control of American foulbrood, to large-scale inspection efforts tied to a rigidly-enforced policy of burning infected colonies. These disparate philosophies, along with large-scale interstate movement of honey bee colonies, contribute to spreading this brood disease, rather than minimizing infection levels. In addition, the results of new technologies, such as ethylene oxide fumigation, cannot be considered totally effective at the present time, contributing to more confusion.

We see, therefore, little to be optimistic about with regard to controlling American foulbrood in the near future. Many beekeepers continue to use antibiotics to keep the disease in check, routinely feeding these as a short cut to solving the problem. Unfortunately, the bacterium causing the disease is not killed by antibiotics; these substances simply mask the symptoms. Always waiting on the horizon are the true causes of the disease, millions of almost-impossible-to-kill spores, ready and waiting to cause another outbreak. These can only be destroyed by fire.

Therefore, we urge caution in the use of antibiotics. Indeed the persistent use of drugs for prevention of American foulbrood makes us downright uneasy. Although we insects are not mammals like you humans, a bacterium is a bacterium, and should be expected to behave in much the same manner irrespective of host. Why then should humans believe that low-level (sub-therapeutic) feeding of antibiotics to themselves to prevent outbreaks of human diseases like smallpox, diptheria, and pneumonia is counterproductive, while at the same time recommending the practice in beekeeping?

Fortunately, the message has finally reached regulators that feeding antibiotics to livestock is counterproductive and in fact can be downright dangerous to humans in the bargain. The practice could produce the unintended consequence of developing bacteria resistant to antibiotics. With this in mind, the unthinking feeding of antibiotics to honey bees has now been prohibited. They are no longer available over the counter to beekeepers, who must now develop a professional relationship with a veterinarian, resulting in prescribing certain medications for specifc diseases as happens in human medicine.

That innate resistance to American foulbrood is present in some parts of our population is a proven fact. Selection for "hygienic" behavior populations are continuing. This is another rationale for burning all colonies showing symptoms – attempting to effectively fix in our population the genes for resistance to this extremely problematic disease. BC

HONEY FLOWS

James **Howard**

Take Your Time And Do It Right To Make It Work

When one passes through the sleepy rural town of Manor, Georgia there is a man and his wife who are honey producers. In 2010 when Shane Barber, an English teacher in a small town, needed extra money to buy his wife some clothes he sought extra work. He started helping a friend who had many beehives and produced much honey. Shane worked for him for a time and decided he would get his own hives and thus started the adventure he, his wife and mother-in-law would embark upon.

He started with around 40 hives and in a short period of time he had around 350 hives. He learned how to care for the hives and maintain them for maximum honey production. As time went by he began to think that bottling and marketing honey was the way to go. He sold the hives and began buying honey in 50-gallon barrels. The going was slow, and he made mistakes along the way. One big mistake that he made was he borrowed too much money with a mindset that he would explode in no time into a big-time marketing company of south Georgia honey. That was the second mistake, believing that he would grow in leaps and bounds in a short time.

He has now learned that in the honey business it is slow, hard, work, and there are no get rich quick aspects to the business. He began to contact stores and built relationships with companies to carry the honey the family produced. That is one of the most important principles of marketing, which is a hands-on approach with integrity and honesty. When he promises a delivery he makes sure he can manage the delivery. He built a customer relation with the Tennessee Tourism Bureau. He also has individual accounts in Tennessee and he and his wife Carla would load up the truck and drive to Tennessee and have a work and minivacation all in one. One such trip cost them the truck. He parked it in the parking lot of the motel and the next morning it was gone.

Shane laughs now but there was a time when he had his honey in local stores he would go by and see if just one plastic honey bear was sold. They now have their specially designed glass container they bottle the honey in so as no matter where one lives they can give the honey as a gift. Many people comment on the container for their design and creativity. The container is one thing that sets their honey apart form other marketers.

Shane believes that men should listen to their wives or wives their husbands in working together. Carla has been a wise partner in the business and has kept Shane from making mistakes unnecessarily that would have hurt the business. He hopes to one day make this the work he does. He loves the fact that it is a family affair and that they can work closely together. One day he hopes to retire from teaching and focus on developing the business into something even his children may take interest in for their means of livelihood.

There are some unforeseen obstacles that crop up at times and must be dealt with to ensure that the maximum potential of the business can shine through. Some of these obstacles are; 1) Stores backing out of carrying the honey, 2) Spending more startup money than you planned, 3) Equipment failure, and, 4) Unforeseen weather patterns that affect things in the business. Some of these problems can be remedied by better planning and wiser spending while others can't be stopped but must be endured and press on with the business.

Shane has worked hard to get his brand of honey into grocery chains and at the moment he is seeking to add more stores weekly. His hands-on approach serves him well he states. Many people have websites he says and one day he may, but for the moment he doesn't have one.

Speaking with people one on one is his way of doing business and he likes getting to know those that he

seeks to do business with and doesn't want to change the atmosphere of communicating directly with potential buyers. He likes the handshake and smile from days gone by.

He and his wife and mother-in-law have worked hard and had faith and the large debt he got into in the beginning has been paid off. He advises that those going into honey production to start slow and easy and not run up a huge debt. That will cause stress that no one needs he says. To build slowly and effectively is the key. There are no magical get-rich-fast-schemes that will work. If one is inclined to believe this, for he once dreamed that the money and business would flow fast and steady, change your thinking he says adamantly.

While Shane doesn't wish to divulge actual figures he says that his profit margin is growing steadily, and he says a 100% increase in the flow of sales and monetary gain has come over the years. He says the way he sees things they will continue to grow for people love honey and it is a great marketable product. He would like all who read this to know the key in his success is integrity, honesty, hard work and an excellent product. These can't be overlooked, and success will follow. He says, "It is very rewarding to see a dream begin to become a reality after working through all the obstacles and struggles that one encounters during the initial phases of building a business."

When one travels through Tennessee and stops at a tourism center they will see C&S Honey Supply products. They will know it is from the hands of the Barber's done with love and care," Honey flows Richly." BC

The Measure Of Success

How do you measure success?

Achieving success as a beekeeper can be elusive. It is a goal that is often based on factors that are changing all the time. It used to be that success in beekeeping was measured by the amount of honey harvested during the season. Today, I would expect that most beekeepers have additional criteria for evaluating whether or not a season has been a success.

Since success in this ancient craft tends to mean various things to different people, I can't begin to explore what success means to you. What I can do is address a few of the things that I have come to use as a measure of my success in beekeeping.

Bees that survive

Thirty-to-fifty percent average yearly colony losses nation-wide for over a decade now means that keeping you bees alive is one of the top measures of beekeeping success in this day and age.

Keeping bees alive means having to pay attention to a wide variety of factors. Everyone tends to stress the importance of keeping the ubiquitous *Varroa* mite under control and while this is important, it can cause folks to ignore other potential threats to survival.

Colonies especially in wooded areas are very susceptible to bears unless steps are taken to protect them. Pesticide exposure that can be lethal both in the short-term and the long-term is a major challenge. Given that it is nearly impossible to locate apiaries entirely out of forage range of flowering plants that have not been exposed to pesticides, about the best a beekeeper can do is not use toxic chemical pesticides in their hives and regularly rotate out the old combs before residues build up to problematic levels. Starvation is still all too common a cause of colony death even though it is one of the easiest things that a beekeeper can prevent with appropriate attention and care.

While the number of pathogens that can cause a colony to decline seems to grow longer every decade, many diseases have tested and approved treatments that work more often than not. Queen problems appear to be an ever increasing cause of colony loss these days and beekeepers that are able to create new queens themselves, or have a secure supplier lined up, have the edge when it comes to dealing with queenless hives. Wintering issues have historically been a challenge in northern regions where colonies must often contend with sub-zero temperatures in addition to a prolonged period of dearth. And across the nation, extreme weather events that too often turn deadly are becoming a greater concern prompting beekeepers to seek sheltered apiary locations on high ground that can resist heavy winds and high water.

For many years I had felt like a successful beekeeper. Average winter losses of 10-15 percent, while higher than I prefer, were nowhere near the 40-50 percent losses reported by others so I felt that I was doing reasonably well. Three years ago I doubled the number of colonies in my care. In each of the last three years since then I have lost 40-50 percent of my bees.

While other beekeepers seem to accept such losses and simply make up for them by creating lots of nucs and splits as replacements every year, this definition of success makes no sense to me. When what you do is not working well, continuing to do the same thing over and over and expecting a different outcome makes no sense. Clearly it is time for me to change my approach since what worked for me when I kept 50-60 colonies is no longer applicable at the 100 plus level, that is if I want to feel like I am successful in my beekeeping.

Successfully navigating the plethora of potentially lethal events that can afflict my colonies is one of the primary ways to succeed in my next measure of beekeeping success:

Avoiding scenes like this in your supers and hive bodies is successful beekeeping.

Preventing comb loss

An extension of keeping bees alive is maintaining enough strong colonies so that the bees are able to protect all the drawn combs in an operation from wax moths and small hive beetles. Reaching for a super of drawn comb to put on a hive only to find it destroyed by wax moths or full of fermented honey and small hive beetle larvae can be one of the most demoralizing things that can happen to a beekeeper, right after finding colonies that have died. When there are not enough bees to keep drawn combs protected, exposing combs to light and keeping them well ventilated will deter most moths, while alternatives like cold storage can work in a pinch for both moths and beetles. Preventing bear damage which can not only kill a colony but is typically accompanied by comb and equipment destruction at the same time, is a major concern in areas where bears range as well.

Similar to the need to protect drawn comb, is the need to protect honey once it is harvested and before it is extracted from the comb. Small Hive Beetle pressure has gotten so bad in recent years in the Champlain Valley of Vermont that this year I purchased a second extractor. This will allow me to keep ahead of the small hive beetles by extracting my honey faster and reduce the risk of losing frames of honey to the beetles. As one extractor is spinning out honey, I can be filling the second extractor with frames. Once I get the second machine filled, the first machine is finished and ready to be refilled as the second machine is running. I suspect that not having to wait around for honey to finish being extracted in one machine before I can refill it again and run another batch of frames is going to allow me to extract my crop about twice as fast as before.

Not having to feed

The less I feed the more successful I feel – despite the fact that having enough food stored in the hive to tide a colony through winter ends up being primarily a weather driven phenomenon. Not having to feed typically means that my colonies were healthy and strong enough to take advantage of the available summer forage. Of course not every colony is always able to gather enough nectar to supply its entire yearly needs. However, if I can take excess honey from colonies that can spare it and use it to feed those in need, I am able to provide the best possible food for my bees without having to spend time and money purchasing sugar, mixing and feeding syrup and cleaning feeders when I am done. In my world, when less work is needed to get the job done, that can be counted as a success.

Success is when a colony is able to gather enough nectar and pollen that supplemental feeding is unnecessary to keep the bees from starving over Winter.

No honey to buy

As a beekeeper, few things are as fulfilling as supplying your household's annual honey needs from the fruits of your own hives. There can be a sense of pride in not having to purchase store bought honey for one's personal needs especially since store bought honey never tastes as good as honey you produce yourself. Of course, colonies that have survived the winter and yet remain strong enough to repel wax moths and small hive beetles, while producing enough honey so they don't have to be fed for winter, will probably also produce excess honey that you can harvest and enjoy. Success builds upon success.

Excess bees that can be sold

One way of helping to prevent strong colonies from swarming in the spring is by splitting them and creating nucleus colonies in the process. Keep this up long enough and the successful beekeeper will have more colonies than is wanted creating an opportunity for an additional income stream from nuc sales. There are simply too many beekeepers out there that are not experiencing enough success, especially when it comes to keeping bees alive, and they are looking for replacement bees.

Making a profit

As those who keep bees as a sideline achieve success in the above areas of survival, comb protection, and not having to purchase feed or honey, there is a good chance profits will follow as a natural result.

Unfortunately, when profits are involved, there is always the danger of falling into the trap of being greedy. Taking too much honey from your colonies for example, is likely to adversely impact the survival of your bees.

The definition of beekeeping success is liable to change over time for each of us. What is critical to success, no matter how you measure it, is to not give up keeping bees. Sure it is a good idea to always look for ways to improve upon what you do and embrace the concept embodied within the Japanese word "kaizen" – small, incremental and continuous improvement. This may mean that you not only modify what you do, but try new things or adjust to new realities as you constantly invest in the health of your hives. One thing is for sure: you're guaranteed to never succeed if you quit. BC

Ross Conrad is co-author of the newly released The Land of Milk and Honey: A History of Beekeeping in Vermont.

SWITCH TO A LONG HIVE

Tina **Sebestyen**

"Thanks for making that less of an ordeal," my friend said as we finished stacking her Langstroth hives back up after inspecting her colonies. The ordeal she was referring to was the difficulty of re-stacking all of those hive bodies without crushing bees. We are both strong farm ladies, so it wasn't the weight of the boxes that was the problem. Weight often is an issue for beekeepers, though, who eventually decide to retire from beekeeping because those deep hive bodies can weigh more than 80 pounds. Many try switching to medium boxes instead, which is awkward because all of their drawn comb must be abandoned. Switching from deeps to mediums is more like starting over. Then, of course, the ordeal of stacking boxes without crushing bees is amplified in mediums, because more boxes are necessary, and medium boxes can still weigh 60 pounds. I never worry about crushing my queen between hive bodies or ladders when checking my long Langstroth hives.

The long Langstroth takes 30 deep frames in a horizontal hive body. There are many advantages to the long Langstroth over the traditional vertical Langstroth arrangement, and less lifting is the most apparent. If the lid is hinged to the hive body, even that no longer needs to be lifted, so that the heaviest lifting required will be of each individual frame, about 7½ pounds when full of honey. My long langs stand on legs, so that the hive is at a nice, workable height, as well. No more bending over to remove combs and inspect that bottom hive body. Another benefit of the hive being up on metal legs is that skunks, raccoons, and mice are no longer a problem. The long Langstroth hive takes regular deep frames, the same ones that are used in normal deep Langstroth boxes. This is a wonderful improvement over the top bar hive.

Top bar hives have been used the world over for years. The long Langstroth has benefits over them as well. One of the major problems with top bar beekeeping is the fragile comb connection to the spline on the top bar. Combs that are newer and heavy with honey can easily fall if inspections are done in the heat of the day unless a more positive guide is used. (I replaced the spline with 1½ inches of plastic foundation, and have never dropped another honey comb). Yet another improvement of the long lang over the top bar is a return to inter-changeability of frames. While top bar hives tend to be made in myriad different dimensions, the long lang is just like a regular hive body inside, but longer. This means that frame feeders fit, frames can be exchanged from colony to colony, and even best, nothing is lost when transitioning from vertical beekeeping to horizontal. The use of frames means that mechanical extraction of honey is simple and economical, since bees don't have to draw new comb as in crush-and-strain operations.

One of the best things about horizontal beekeeping, whether in long Langstroth or in top bar hives, is the simplicity of the equipment. I have an entire shed full of extra deep hive bodies, medium supers, hive top feeders, bottoms, and tops to go with my Langstroth hives. With horizontal beekeeping almost everything you need is right there. No more arriving at your out-yard and realizing you need a super. I even leave the frame feeder in place most of the time, ready to fill if necessary. Another great thing about the long Langstroth is that it is made of 2-by material. The extra thickness of wood helps keep the hive temperature slightly more even.

There are some slight differences in management between horizontal and vertical beekeeping. Rather than using the number of hive bodies to regulate or encourage growth, a follower board is used. The follower board fits exactly inside the hive body, so that bees cannot pass from one side to the other. This allows the beekeeper to help a new colony feel like they have a defensible space, and is a simpler way to increase available space than adding hive bodies as in Langstroth beekeeping. Use of the follower board also allows the hive to be used as a queen-right cell builder, when used with a plastic queen excluder, cut to fit.

The follower board and length of the hive also allow the beekeeper to make an unexpected split right on the spot. If I discover swarm cells, my response is to find the queen and move her to the other end of the same hive, beyond the follower board, along with mixed brood, honey, and bee bread. Several shakes of nurse bees, and I'm all done. If the swarm queen does not return from her mating flight, as in about 20% of flights from my yards, re-combining the old queen and her nuc to the original colony is easy. I duct tape a piece of newspaper inside the hive body up against the queenless cluster, cut a few small slits, and move the queen's nuc up to it. The only extra equipment I needed was a sheet of newspaper and roll of duct tape.

A two queen system is easy in a long langstroth. The solid follower board is placed between two colonies in one long hive, the queen excluder is laid on the last five

frames of each, and supers are stacked above so that they can be worked by both colonies for improved honey production. In vertical beekeeping, one of the queens must be killed in Fall, since the double queen excluder must be removed from the hive before Winter. In the long Langstroth, both colonies are fine just as they are, though it becomes very important to assure that back-filling of the brood chamber is thorough.

In horizontal beekeeping, the queen can become honey bound when a heavy flow begins, especially in a new colony that may not have a full contingent of drawn comb. The bees add honey behind the brood chamber. The simple solution is to move empty drawn comb or frames with foundation up behind the brood, and in front of the honey combs, allowing the bees more space for brood. Again, it was all right there, no wishing for another hive body to ease the crowding of a Spring colony in a nectar flow. This can mean that the hive will need to be monitored more closely, though in Spring it is common practice to visit hives once a week, and not less than every other week. This visitation schedule is more than adequate. I usually place five drawn frames or foundation between brood and honey at a time, remembering not to break up the brood chamber.

As in Langstroth beekeeping, we must pay attention to where the brood is at the beginning of Winter. In vertical Langstroth hives, we make sure the brood is at the bottom, with honey above. In horizontal beekeeping, we make sure that the brood is towards the front of the hive, with the honey behind them. The bees' normal placement pattern puts one or two frames of honey at the entrance, then bee bread, then the brood, with honey behind. This is what the bees want, though in the Fall, they often start back-filling the brood chamber from the door, placing five or six frames of honey before the brood. It is important that the entrance be at one end of the hive rather than in the middle, so that the bees can follow the honey frames in one direction all Winter. If the entrance is in the center of the hive, the bees will have the brood there, and the honey will be at each end, leading to possible starvation in early Spring.

Another wonderful benefit of horizontal beekeeping is that the comb can be manipulated in early Spring without disturbing the cluster. If a piece of burlap is laid on top of the frames, the bees will propolize it, making a solid roof over themselves. In early February, I roll the burlap from the back, towards the entrance, to about where I think the brood chamber is. I move empty honey comb to the back of the hive, and move full honey combs up against the back of the brood chamber. I've made it much easier on the house bees to keep the cluster fed and warm, and I did it without disturbing the cluster. In Langstroth beekeeping we usually reverse hive bodies in Spring to force the bees to fill both hive bodies with brood. In horizontal beekeeping, there is no need for any measure in Spring, the bees are doing what they want to do, and it is just what we want them to do, as well. Winter feeding can easily be accomplished by placing bee candy right in a frame to set, and pushing it up to the back of the brood chamber.

One of the challenges of top bar beekeeping is mite treatment. The treatments are meant to work in a well-ventilated Langstroth hive where the bees have access to the tops of the frames. These work quite well in a long Langstoth setting, though it is important to remember that in horizontal beekeeping, the honey supers are always on. Extra combs can be removed, and the follower board placed behind the brood chamber for the duration of the treatment. This is a little more trouble for the beekeeper, but not a big deal. I expect the shop towels with OA and glycerin to work quite well in horizontal beekeeping, and then the honey frames will not be an issue. With the entrance on one end, it is easy to insert the vaporizer for the mid-winter mite treatment if necessary. Finding and removing drone frames for culling is easy since every frame can be seen without unstacking five hive bodies as in Langstroth beekeeping in August.

I haven't found a commercial producer of long Langstroth hives yet. They are easy to build with basic woodworking equipment. Cabinet-makers can often be convinced to mass produce these hives for a bee club, thereby improving the local economy, too. There are free plans to build the long Langstroth on-line, but I've retrofitted them with hinged bottoms that open, and screened bottoms with pull-outs for mite drop and monitoring and ventilation in Summer. They are available on my web site **https://beequest.buzz** BC

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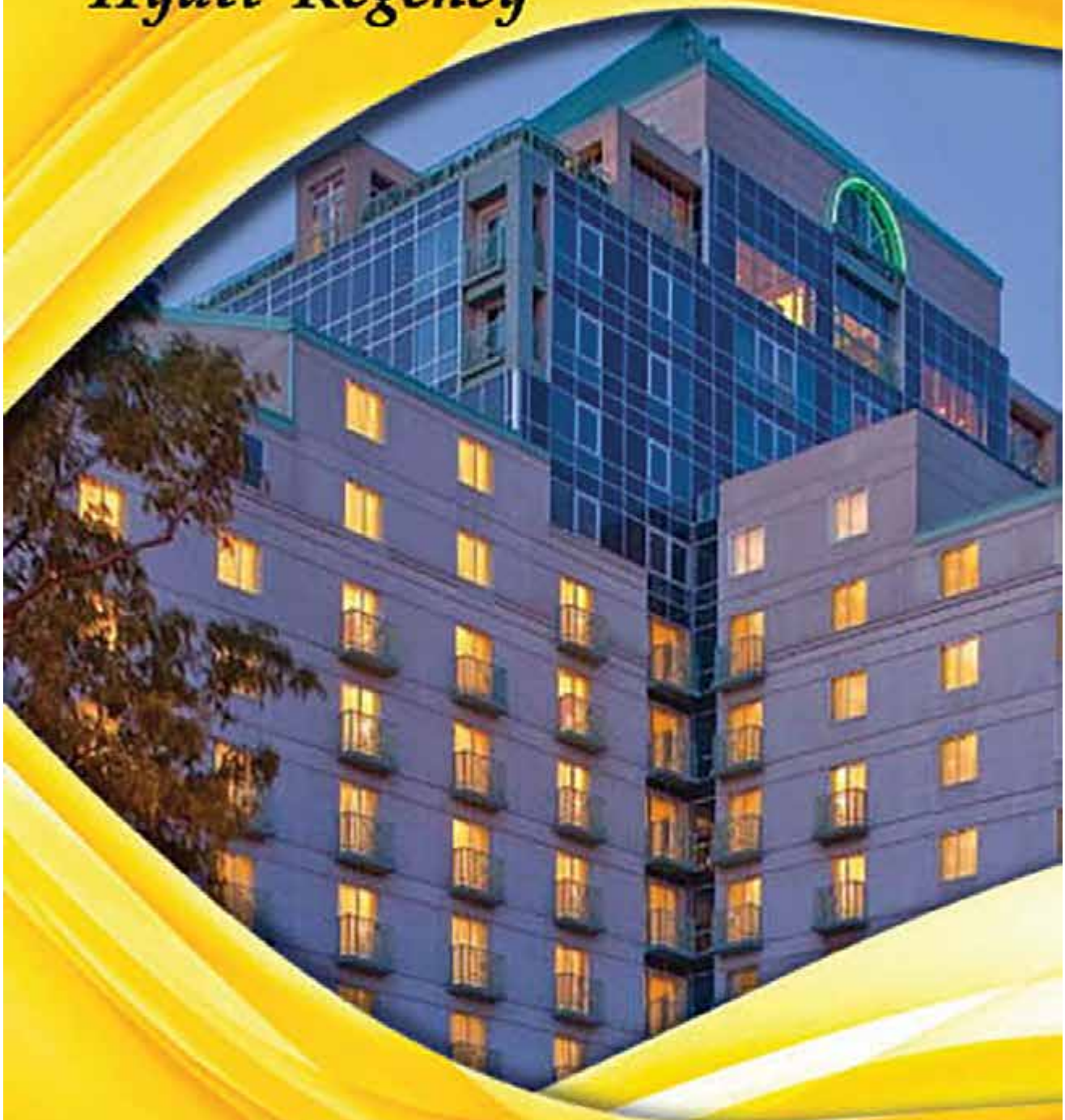

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***Varroa* Mite Management Strategies Class** will be held October 13 at UC Davis from 9:00 a.m. to 4:00 p.m. at the Harry H. Laidlaw Jr. Honey Bee Research Facility on Biology Road.

The course is limited to 20 participants and the fee is $200 which covers materials and lunch. Bring your veil or beesuit.

For information contact Wendy Mather, **wmather@ucdavis.edu**. To register visit **https://registration.ucdavis.edu/Item/Details/580.**

♦COLORADO♦

The CO State Beekeepers Association will hold its Winter meeting November 2 at the Douglas County Fairgrounds in Castle Rock.

Speakers include Elizabeth Walsh and Amy Franklin.

For information visit **Coloradobeekeepers.org.**

♦ILLINOIS♦

Illinois State Beekeepers Association will hold their Fall meeting November 9 at the IL Department of Ag Building, State Fair Grounds.

Speakers include Tim Wilbanks, Gary and Ginger Reuter and Adam Dolezal.

For information please visit **ilsba.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 JERSEY♦

Bee-ginner's Beekeeping will be held October 10-12 in Bordentown, NJ.

For information visit **http://www.cpe.rutgers.edu/courses/current/ae0401ca.html.**

♦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**.

♦PENNSYLVANIA♦

PA State Beekeepers Association State Conference will be held November 1-2 at Ramada State College Hotel and Conference Center.

Speakers include Jeremy Barnes, Jim Bobb, Deborah Delaney, Steve Repasky, Larry Connor, Tom Seeley.

For information visit **www.PAStateBeekeepers.org.**

♦SOUTH CAROLINA♦

Natural Beekeeping Symposium will be held November 16 hosted by the Charleston Area Beekeepers Association.

The speakers are Tom Seeley and Leo Sharashkin and the cost is $36/person.

For more information visit **https://www.charleston-bees.org/become-a-member/natural-beekeeping-symposium.**

♦VIRGINIA♦

Learn How To Build The Sun Hive - October 11-12 at Spikenard Honeybee Sanctuary.

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

♦WASHINGTON DC♦

North America's Pollinator Protection Campaign will be held October 22-24 at the U.S. Dept. of Interior, 1849 C Street NW, Washington, DC.

Speakers include Bryan Arroyo, May Berenbaum, Diana Cox-Foster, Clint Otto, Margaret O'Gorman, Mylea Bayless, Tim May, and Laurie Davies Adams.

To register visit **www.nappc.org**.

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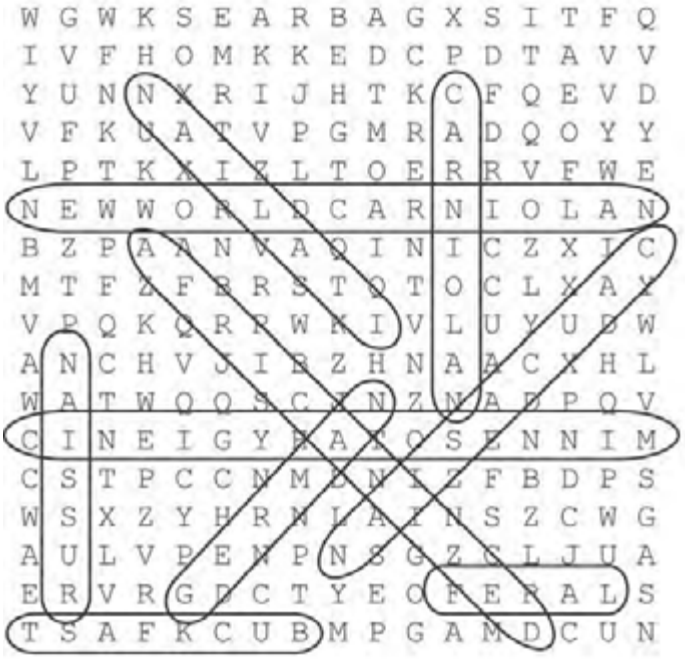

On my way to the Flat Tops, across from the old-time moonshiners' hideout by the big bend, I passed the lonely mule. He's always there by the road. He used to have a buddy. They'd stand side by side, nose to tail, swatting flies for each other. They looked reasonably happy, those two. I don't know what happened to his companion, but now whenever I pass by, I muse that I'd like to put a donkey in there with that mule, for company. I wouldn't tell the property owner. I'd just turn her loose.

When I arrived at the Flat Tops Dodo yard, I discovered that a bear had climbed over the woven-wire solar-electric fence and raised some hell. He only ate a hive-and-a-half, but he destroyed both queens. Judging from the remaining young brood and no eggs, I missed him by about four days. I put things back together the best I could and swapped the six-volt charger for a 12-volt spare I had in the truck.

I ran into Mike, whose family owns the property. I said, "How's your dad?"

"He passed away in May. Didn't you know?"

I guess I didn't. I liked old Warren. The first time I went up there, he showed me around. We picked a place for my apiary. Warren told me that when his Italian granddad was a teenager, he stowed away to come to America. But he got on the wrong ship and landed in Libya. So he stowed away again. When he made it to the States, he lit out for Colorado and homesteaded.

The last time I dropped off the honey rent at Warren's ranch house – before he moved to the old folks' home in Rifle a few years ago – he told me I should stop by more often. I told him I would. That was the last time I saw him. Regrets come easy when you know better, but you still didn't do the right thing.

When I got back, the gal Marilyn was stranded in Glenwood Springs, 12 miles from home. A mudslide had closed I-70. I told her to check into the hostel. I thought the blue heeler Pepper and I had the place to ourselves for a night. Imagine my surprise when at 10 p.m. she called and asked if I might pick her up at the boat ramp across the Colorado River from our place. The little darling caught a ride on a raft and floated through Glenwood Canyon under the stars! Girl is fearless and continually amuses me.

Marilyn's free spirit doesn't delight everyone, however. Some weeks later we were 20 miles outside Durango, where I gave some beeyard tips to the local bee club. After she'd seen enough long hives and top bars, Marilyn slipped away with Pepper for a phone conference. Reception was sketchy out there in the sticks, but she found a deserted little lane where she got a clear signal.

She made herself right at home, partially blocking the road as she set up her lawn chair and made her call. Then a woman came by. "You're on private property," the woman said. "Would you mind pulling over so cars can get by?"

Marilyn did what the woman asked. Next a four-wheeler-load of kids roared past. Engrossed in her call, Marilyn thought nothing of it.

Pepper was across the road sniffing weeds when a pickup came tearing down the lane, horn blaring. "You're on private property!" the red-faced driver shouted as he jumped out, grabbed the phone out of Marilyn's hand and threw it and her folding chair into her car.

Marilyn pretty much kept her mouth shut, until he hurled the ultimate insult, calling her a "F#%&* liberal!"

"How would you know anything about my politics?" she shot back.

The situation deteriorated when Pepper bit him. Good boy! It's natural – noble, even – for a dog, sensing aggression, to come to its master's defense. And heelers like to bite, anyway. That's why we call them "heelers."

Fortunately no firearms were brandished. Still shouting, the landowner took photographs of Marilyn's license plate as she retreated back down the lane.

When Tina and I caught up with her, Marilyn was still clearly shaken. We talked about contacting the sheriff but weren't sure where we stood legally. This would almost certainly turn into a he-said, she-said standoff. To complicate matters, Pepper was overdue for his shots. He might get impounded to see if he died from rabies. We didn't want that!

So we didn't call the sheriff, but we wondered if maybe the landowner did. We'd made arrangements to stay with old Durango friends Mike and Sandy that evening. When I called Mike, I left the story for later, saying only "Mike, the law might be looking for us. Can we hide out at your place?"

"We can put you up in the attic," he deadpanned. When we arrived, he said, "Put your car behind ours, so nobody can see it from the road."

Marilyn's our ditch walker. Maybe having the privilege to trespass in order to check the ditch made her a little casual about other people's property. We had a conversation about property rights. We never heard from the La Plata County sheriff or anybody's lawyer. It's been more than 10 days, so Pepper's safe from quarantine. He got his shots. Everything's going to be just fine.

Ed **Colby**

Trouble In Durango