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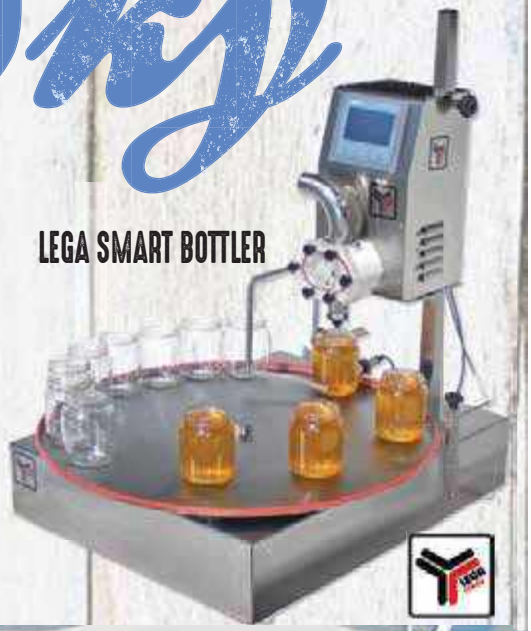

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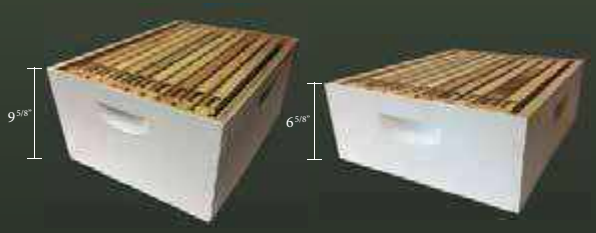

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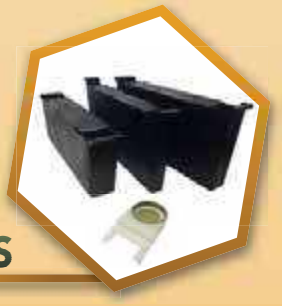

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Bee Culture

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In Every Month –

HONEYCOMB HANNAH

By John Martin

BeekeepingToday Podcasts

I was really glad to see you guys had some new podcasts up again the last few days. I was getting a little testy and aggressive due to the dearth of good new episodes.

I appreciate the work you guys do, and it really is the best podcast on beekeeping that I have found. I eagerly wait for the next episode. Keep them coming.

James Judd

Editor's Note: *Thanks, James. We appreciate your feedback! You will be happy to hear we are lining up some great guests. We will be releasing a new podcast each day of Pollination Week, June 17-23. (Podcasts will go out the June 17, 18, 19, 20 & 21). Let your fellow beekeepers know and be sure to rate us on your podcast service!*

Thanks For BC Copies

Thank you so much for sharing copies of *Bee Culture* with the students of the Master Beekeepers Apprenticeship Beekeeper Course (Tim's Thurston County class). We are loving getting to know all about bees and really appreciate your generosity in providing us with beekeeping resources.

Christine Gibert

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Calendar Contest 2020

2020 – HONEY!

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

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

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

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

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

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

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

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

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

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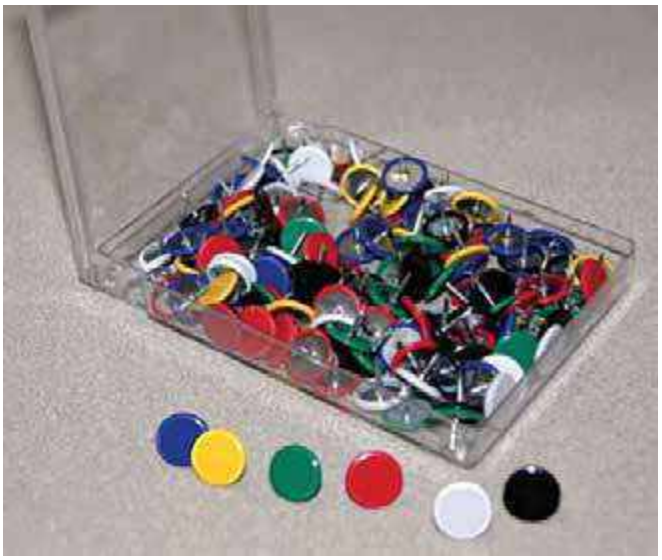
Number 1 Tip of the Month – What Color Was That Queen?

I'm sharing a small technique used to remember what color a marked queen is in a particular hive before opening it, nice to know what color to ask your brain to look for in advance. The last couple of years I started to make my own nucs, over wintering them, allowing me to get away from buying package bees. It has worked fantastically. I only have five hives from various years and I was raising my own queens and painting the color code onto them. When I returned to the nucs and hives I could never remember what color I was looking for. Not that it was awfully necessary to know up front to find the queen. Then I got an idea. Why not put a colored thumb tack on the outside of the hive telling me the color of the queen inside. I have few hives but if you had a lot and had marked queens it would make for a quick inventory of your queen ages without opening. Also, if you opened the marked hive and found an unmarked queen then you know you had a swarm occur and if so maybe rethink your management plan. I found the thumb tacks at a CVS pharmacy and could not believe the colors included were exactly the colors used for queen marking. There is even a black thumb tack for using as an unmarked queen indicator. You get a ton of tacks and they are easy to throw in the equipment you carry. When marking my hive I placed my tack on the corner of the outer cover and started finding it was also a good idea to put another one under the lip of the outer cover too. That way when the outer cover is flipped over on the ground during inspection you can see the color. My memory was so short I could not remember what the color was from the time it took to open. A hive tool can quickly change it out for another color if you change queens. I was initially worried that the sun might bleach out the color or the weather rust them but neither occurred. I took samples of several tacks and put them on the side of my chicken coop in full sun exposure all Summer and Winter as a test. Their color held perfectly. Hugh Gibson, Vermont



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.

Keep It Simple

Rubber washing up gloves make your hands sweat and will stink unless turned inside-out after each apiary. Nitrile ones are longer lasting, but very difficult to turn inside-out. I now use only the thin nitrile disposable gloves and change them after each apiary. Latex single use rip too easily.

Always carry a few queen cages (I always have a clip type in my beesuit pocket).

If you have a colony on the point of swarming and you have no spare equipment, cage the queen and put her on the crown board. You can then come back later, or the next day, to split the colony - knowing that the queen is there and not having to find her again.

Instead of painting all your equipment the standard white, paint the equipment the corresponding color of that year's queen color. After successive years with five-year color rotations, you'll be able to tell roughly how old a piece of equipment is by looking at it. Plus, it ends up creating a random assortment of hive colors, which significantly reduces drifting between colonies as it allows the bees to more naturally orient to their own hive location. You can still use mismatch paint (provided it still is roughly close to that year's queen color). Plus it looks neat! Justin Kay, Greensboro, NC

Frame washing frame. Gary Shilling, Springfield, NJ

One of the most important "good ideas" that I have discovered related to processing honey is to ask my customers to recycle their canning jars to me.

Then I put them on the shelf and recycle them myself in the processing and canning of honey every year. I have been doing this since I started processing and selling honey in 1999. As you can see from the photos I have a good supply. Some of my customers glean the good will stores and find jars for me there and many of my customers donate the jars they find to me as they like to be part of the process of preservation of the local honey supply and the ergonomic contribution the jars make to the process.

Because moth crystals evaporate placing them in multiple locations in tall stacks can be a hassle. there are some spacer/drawer systems available from commercial bee suppliers but money was tight and I had some PVC pipe leftover from a job and I repurposed some. After trying several designs I arrived at one that easy to fabricate. Basically this is a spacer shim with a crossmember to support the pipe. The caps on the end limit the pipes travel and a wood block on the crossmember keeps the pipe vertical. Slide the pipe out, fill it with crytals and slide it back in place.

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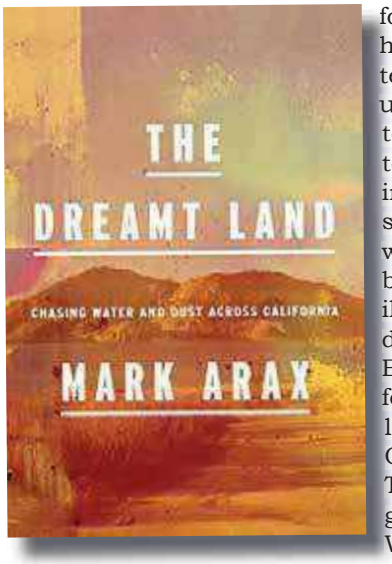
The Dreamt Land, by Mark Arax. Published by Alfred A. Knopf, 564 pages, hardcover. ISBN#9781101875216. Available on Amazon.

When people think of California, most picture Southern California and the Bay Area. The "Other California", our vast Central Valley, gets little attention, maybe because of its relatively sparse population, and, to many, it's bland landscape. Fresno native Mark Arax's sprawling new book *The Dreamt Land* aims to remedy this neglect. He draws on his years of intimate knowledge of our valley that began when, as a child, he wondered where all the water in the canals surrounding his grandfather's farm was going. Arax, with his intimate, first-hand knowledge of the Valley, borne of decades of exposure, was destined to write this book and is, perhaps, the only person who could do the subject justice. In the hands of a less skilled writer, the subject matter might remain a dry compilation of facts devoid of the many nuances and the many little-known human stories buried within. Arax's many contacts along with his mastery of language, including his ability to compose colorful word pictures of seemingly mundane subjects, spins chaff into gold, weaving facts and associated anecdotes into an entertaining tapestry easily accessible to everyone.



As an agricultural consultant in the valley, based in Bakersfield, I often make the trek to Fresno, 100 miles north and also to farms 60 miles west, using the radio and books on tape to break the monotony. Here's Arax covering the same ground: "Twenty miles outside Fresno, I cross the Kings, the river that irrigates more farmland than any other river here. The Kings is bone-dry as usual. There's a mountain range to my left and a mountain range to my right and in between a plain flatter than Kansas where crop and sky meet." and, continuing west "Behind me, the hard line of agriculture ends. In front of me, the hard line of desert begins. In between wends the concrete vein that funnels the snowmelt from one end of California to the other." That last sentence highlights the recurring main theme of the book: Water – it's scarcity during periodic droughts and where to store it during wet years, with underground aquifers being the preferred method of storage. Arax, along with others, concludes that the current situation is unsustainable – that a significant acreage of farmland will have to be retired in order to allow everyone to get their fair share of water.

Arax divides our huge valley into manageable parts: the citrus belt on the east side, the always water-short west side, the area near Fairmead northwest of Fresno where an undependable aquifer forces residents to haul in bottled water; he introduces us to a host of interesting characters along the way including two east side citrus growers with ties to notable Southern families: Loren Booth, daughter of Otis Booth (cousin to former Los Angeles times publisher Otis Chandler) and Tom Mulholland, great grandson of William Mulholland who was famous (or notorious) for diverting Owens Valley water to the San Fernando Valley – the subject of Chinatown, the classic movie that cemented Jack Nicholson's reputation as an actor. Among others, we also meet Jack Pandol Sr. and Jr., Kern County grape growers, and Jack Woolf who farms thousands of acres on the Westside. Arax's grandfather, Aram Arax, makes cameo appearances throughout the book.

Some Valley residents suffer from an inferiority complex, partly because their supposedly more sophisticated, and generally more liberal relatives and friends in coastal enclaves express sympathy for them for having to survive 100 degree Summer days as well as enduring what some believe to be a redneck culture – not necessarily a pejorative term, as many so-called rednecks, are more honest and harder-working than your average liberal. Where are your intellectual liberals in this cultural desert, your friends may inquire, as if the term requires respect, when in fact, there are no written guidelines to define an intellectual liberal and no criteria to show that your average liberal is a superior human being to your average redneck. Although he might deny it (or respond, "I've been called worse") Mark Arax is both an intellectual and a liberal, a characterization amply supported by his writing – and yes, he may have picked up a touch of redneck, as some Valley liberals have, via years of exposure.

Our valley is sometimes disparaged for its drab landscape – mile after mile of trees, vines and row crops – beautiful vistas for farmers, not so much for city-folk. There is one time of year, however, when there is no more beautiful place in the world than the Valley: almond bloom in late February. Fall foliage displays in New England deservedly attract huge crowds, Valley almond bloom, not so much. A million acres of almonds in full bloom, is, arguably, far more spectacular than any fall foliage display. Fall foliage does enjoy a significant advantage over almond bloom: it can last up to two months, making it easy to schedule a visit at a convenient time; peak almond bloom, on the other hand, rarely lasts more than 10 days – much less if bloom-time temperatures reach 80 degrees, which can happen. To catch peak almond bloom, aim for February 24th and drive north on Hwy 99 from Bakersfield to Stockton. Get out of the car and (with permission) walk through an almond orchard and allow your nostrils to savor the blossom fragrance as you listen to the happy sound of multitudes of industrious, happy honey bees that the grower has rented to pollinate his trees. Don't worry about getting stung – bees working flowers won't sting – but don't go near their hives since bees get defensive close to their homes. It's still Winter according to the calendar, but you're getting an invigorating, premature dose of Spring, that many wish they could share with you.

Any book on the central valley written after 1980 would be incom-

plete without covering mega-farmer Stewart Resnick. Arax does not disappoint. Because Resnick was familiar with his past work (and perhaps because he wanted to control the narrative) Resnick granted Arax a rare sit-down interview, possibly the only one given by the media-averse mogul. The Dreamt Land devotes, an entire 42 page chapter to Resnick, his wife, partner and marketing genius, Lynda and their Wonderful Company that markets their almonds, pistachios, citrus (including seedless mandarins, sold as Halos), grapes and pomegranates (including POM Wonderful pomegranate juice). Resnick is "the single biggest grower of almonds, pistachios, pomegranates and citrus in the world. Last time he checked, he owned 180,000 acres in California. That's 281 square miles, almost the size of the five boroughs that make up New York City. He is irrigating 121,000 of these acres. This doesn't count the 21,000 acres of grapefruits and limes he's growing in Texas and Mexico. He uses more water than any other person in the West. His 15 million trees in the San Joaquin Valley consume more than 400,000 acre-feet of water a year. The city of Los Angeles, by comparison, four million human beings, consumes 587,000 acre-feet." (1 acre foot of water = 326,000 gallons). Resnick has been involved in many water transactions over the years, making deals to ensure that his trees get enough water to continue to produce bountiful crops. Most of these deals are probably legal; some may be questionable from an ethical standpoint.

Resnick's empire started in the late 1970s when he purchased thousands of acres of prime ag land in Kern County at bargain-basement prices from oil companies that wanted out of farming. He added to this base in subsequent years with timely purchases of distressed properties in Kern County and in adjacent counties. Resnick is a complicated character. Unlike most famers, he has a liberal bent and has provided the deserving children of his farm workers with college scholarships. He has invested millions of dollars in and around the small farming town of Lost Hills (including a state-of-the-art soccer park) where many of his farm workers live, The Resnicks are also building an 80 million dollar charter school complex in Delano. If Resnick had been a large grape grower in Delano in the 1960s, we would never have heard of Cesar Chavez (or Dolores Huerta).

The Dreamt Land places Arax alongside three other iconic and revered Valley authors: Joan Didion (of the Sacramento Valley), William Saroyan (also a Fresno native and a fellow Armenian) and John Steinbeck. While these three icons of literature have made valuable contributions on a number of subjects, Arax took on the gargantuan task of making sense out of an entire valley in one massive undertaking. At 528 pages, the book may intimidate some but those that open it and start reading will be amply rewarded for the effort. The book is broken down into 21 easily digestible chapters, many of them stand-alone mini-books. Arax was born to write this book and readers should take advantage of his gift.

With the wealth of material provided by Arax, *The Dreamt Land* would make a good movie, arguably as good as or better than Chinatown. And, in Ken Burns's skilled hands, it would also make a worthwhile and entertaining documentary. Should either (a movie or documentary) happen, readers could brag: "I read the book!"

Joe Traynor, June 2019

INNER COVER

So, the unemployment numbers in this country have been staggeringly low for the past few months, and I am quite sure that is good for folks who not long ago were looking for a job. It is, however, a difficult time for those in the hiring mode because there are so few candidates to choose from when a position opens and it needs to be filled yesterday, because, you know, customers are waiting.

I've had jobs where I had to hire people where both situations came to be. Too many people looking for too few jobs, and too many jobs looking for too few people. The first has always been a better position to be in when hiring somebody because you can be picky, or, at least pickier.

I once had to hire two summer interns to help with field research on ornamental and vegetable insect control for the homeowner. The two positions were basically designed to manage about five acres of various ornamental crops, mostly annuals like zinnias, marigolds and the like, but also vegetables to be eaten, and perennial ornamentals like crabapple trees and roses.

The jobs included things like preparing the fields (rototillers), weed control (hoes and rakes and shovels), spray applications (tractor and sprayer basics), mowing and data collection (measuring before and after insect populations). Qualifications included, well, you can about guess what you had to be able to do to be able to do the job. Certainly there was always some OJT because data collection isn't in most folks experience book, so that was a given, mostly. But rototillers, tractors, hoes…that year it had to be second nature to even be considered.

One student had a farm background and pretty much knew everything needed. The other had a yard and garden background so was at least familiar with the concepts of what was needed. And both were in the AG School, not Liberal Arts.

In the good years, with more kids than jobs, you had applicants with backgrounds like this applying by the dozen because they needed all the work they could get to pay college expenses. I got to where I was because I was one of those looking to pay for college costs. Those were the easy years. In fact, I usually learned more from them than I was able to teach because they had the experience of years on a farm.

It was the bad years, when all the good kids already had jobs that you went looking for bodies, any bodies. No experience was the norm, and not even a thought of experience was more common than not. They weren't dumb…they were urban, they were poets, they were accountants, they didn't have dirty hands. Mowing the lawn was about as agricultural as they got, and even then it was usually a riding mower rather than a push mower. These kids just needed any kind of work that could give them a decent recommendation next time. I was always a second or last choice.

Those were challenging summers, but we managed. And by the time school started again most of them had dirty hands, a good tan and a new appreciation of where food came from and how much work it took to get it on a table. For me, that was the best thing they could learn. And, it turns out, over the years I've managed to touch base with some of them (now lawyers, accountants, CEOs and Business leaders of all kinds), and for some it was the best summer job they ever had. They learned something they didn't expect to learn that had value, and it lasted them a lifetime.

So, where's all this going….unemployment, summer jobs, poets? Well, my boss is going to be looking for somebody to sit in my office later this year. That's because I won't be there, full time anyway, anymore. Really.

That's because, after just over 33 years here it's time to spend more time in the garden and beeyard than in an office. Don't get me wrong. I really like this particular office because it's the only one in the whole company that has windows on all three of its sides. Yes, it's a triangular corner office, occupied by editors here on and off for most of the 90 some years the building has been here. It's bright and airy and spacious enough, but for reasons unknown to the fix-it people here, the air conditioning and heat don't work. But that, friend, is a small price to pay for natural light and not living in a cube. I have a heater and a fan, and it is heaven in here, all year 'round.

When is all this going to happen? Well, figure before snow falls here in Northeast Ohio, but not much before – Thanksgivingish is about right I think.

Kath has a couple years to go before she hangs up her keyboard, and there are some projects that ABSOLUTELY must get done this summer that have taken way, way too long. And then, there are a bunch of projects I'd like to do, kind of part time, after I'm officially done.

Being around to help the new person has been tossed back and forth, and the boss kind of likes that idea, because there's nobody here that knows all of the things that go on in the office. Kath knows a lot of it, but she has a full time plus job here doing what she does so won't have tons of time to be training new people. They will have to be mostly house broken on day one.

Unemployment.

What are they looking for? I'd like to think another me, but that's not realistic. I came here without a lot of the skills now necessary, even critical. I had some USDA honey bee research experience, several years of farm and nursery work under my belt, and a bit of writing for Extension Bulletins from the University of Wisconsin. And I'd done some Beekeeping and museum Newsletter production and editing and article writing. Plus, I was on the Board of EAS, and was President of the Connecticut Beekeepers Association, so had several layers of experience. I did have some things going for me.

But now over 1300 magazine pages a year, several books, calendars, October Events, social media…it took me this long to get it right most of the time. Don't get me wrong about leaving. It's been a pleasure, even more, an honor to be able to do what I get to do every day for and with this industry and its people. I've said for all these years, I don't have to go to work, I get to go to work…this job is that good.

But back to what the folks here are looking for. A beekeeping background for this is critical. OJT just doesn't work for this because for the most part you have to know more than most of the readers, and at least be aware of industry leaders and businesses. That applies for both commercial and hobby levels of this art, science and craft. I'll go back to that poet – a straight A, 10 year experienced journalism expert would flounder here for quite awhile before he, or she, got the basics of swarm management, varroa control or commercial honey packing figured out.

Journalism experience on some level is going to be important though. Chasing stories, making contacts and finding hidden nuggets of information is part of the deal, and then there are the four people who work here that will, to some degree answer to you. But, of course, you will answer to them as well because for most of this job they know more about what's going on day to day than you do.

Then there's the regular magazine stuff. Sixteen deadlines a year to start with, on time almost every time is critical for all of them. And all the regular things like renewal notices, new subscriber programs, newsstand sales business, dealing with printers and paper and costs, the post office's rules and regulations, and subscription brokers, plus advertising in other journals, budgets for both magazines and any books published, medical and life insurance and salaries (Kath pretty much handles all the staff issues though), any travel to meetings, outside services like the pollinator garden landscapers, new equipment and such, and all the other stuff you have to purchase to do the job on a sometimes basis.

And then there's the social media blitzkrieg that is ongoing, every day, night, weekend and in between. Facebook, Instagram, Twitter, The BUZZ, two web pages, and emails and more. The people who have sat here before me didn't have any of this to deal with. I hope they appreciate that fact.

And, of course, you have to fill about 100 pages of one magazine every month, and 64 pages of another four times a year with…something. Finding authors, or letting authors find you is a never-ending task. We have some spectacular regulars but they are only part of the picture. Long ago, a wise old editor of a farming magazine I still read told me that it seemed to him that those who knew what they were talking about were too busy to write about it, and those who had the time to write about it too often didn't know what they were talking about. I've found this to be somewhat true, and separating the wheat from the chaff, or, as we like to say here the honey from the wax is also part of the job. You have to know both so you can choose the best. It isn't easy and sometimes you'll get it wrong. That's a given.

What else? The A. I. Root Company is celebrating its 150th year anniversary this year, and there is a rich heritage of beekeeping fact and lore and legacy that stands behind you when you produce something with their name on it. Though they have evolved into a very large candle manufacturing company, they still take this magazine and this department very seriously. They have a reputation to protect and to honor, and they don't fool around with that at all.

And perhaps finally, the office I mentioned earlier is located in Medina, Ohio. That's in Northeast Ohio, about 30 miles south and a bit west of Cleveland. It's not terribly rural, but it's certainly not urbanized to death. Akron is about 25 miles due east, so if there's an urban fix you need to have once in awhile there are universities, museums and city life not far away and easy to get to and from. Close enough, in fact, that you could choose to live that lifestyle and easily make it to work. Lots of people do just that.

There are particulars, of course, not mentioned here, and for the whole shebang send me an email with Editor in the subject line and I'll send along the official Party Line on requirements and what you'll need for a resume if you choose to chase this further than you have already by reading this. Or, send along your resume, a cover letter and some clips to me at the same email. We offer all the regular benefits, plus you get to play with the bees across the street every once in awhile and work in the pollinator gardens out back, too.

And recall, we won't drop you in a no man's land without back up, reinforcements and as much help as we can offer, for awhile anyway.

So, Interested? I was when John Root offered me this job 33 years ago at an EAS Board meeting, and, even though the garden, the deck, more books and certainly the beeyard are calling, I still am. Really.

It All Started With A Swarm Of Bees

Join Us October 11 - 13 To Celebrate 150 Years Of The A. I. Root Company and American Beekeeping History

Friday Afternoon: tours of the A. I. Root Candle Factory
Evening: meet and greet with the speakers and snacks

Saturday & Sunday:

- L. L. Langstroth and A. I. Root discuss old times
- Jim Tew talks about all the old authors
- L. L. Langstroth talks about My Hive
- A. I. Root talks about the beginnings of the beekeeping industry
- Wyatt Mangum displays and discusses early beekeeping equipment
- Tammy Horn Potter looks at the history of women in Beekeeping
- Jerry Hayes looks at the history of the industry organizations, groups, movements
- Gabe Dadant talks about the history of the Dadant Company
- Jim Thompson discusses equipment from his extensive collections
- Plus much, much more!

Register Now!
www.BeeCulture.com

Only $60 per person!

To See Lodging Information
And Register Visit
www.BeeCulture.com

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

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

It's Summers Time –

I hope you are having a great Summer. Well, as I write it's not officially Summer yet, but it will be by the time you get this. We're finally having some warm weather here in Northeast Ohio, but also lots and lots of rain. The older guys here have always said never plant your garden before Memorial Day – well this year you didn't have that option anyway. Just trying to mow once in a while has been a real challenge.

We've been home for three weekends in a row – somewhat of a record for us – and we've gotten a lot done outside and inside. Almost all of the inside plants have made their way to the deck outside. We're down to the heavy ones that we'll need some young male muscle to help us. I love being able to be outside and do physical work, although it challenges my older, very sedentary body.

The poultry population has had some bumps. We're down to 14 of the older girls. I went to close them in one night and one of our white Light Brahmas had gone missing – just gone. No loose white feathers anywere, just gone. The next night another, same breed, gone missing. The third night one of them was back. She just kind of walked up behind Kim as he was watering plants on the deck. The next morning she had tipped over dead.

The young group – ducks and chicks – are doing fine and so funny. They're all still very skittish. I'm working on that. And those ducks, boy can they move fast. Some have escaped into the garage. Fortunately the coop is connected so at least they are somewhat confined. But getting them gathered back up is a challenge.

The baby chicks had their first taste of the outdoors this week. It's loud – me mowing and the motorcycles going by – and scary, but by the end of the day they seemed pretty comfortable out there.

As I was about midway through my mowing on Memorial Day I got a strong whiff of the Black Locust trees blooming. I smelled it before I could see it. It makes me sneeze like crazy, but it's worth it. In a good year we have bloom for about a week and if it doesn't rain the bees have a feast. Memorial Day was beautiful so hopefully they got a lot of nectar.

Several months back I asked you to send in your bee tattoo photos and here are the results of that inquiry. Please continue to send them in and every once in awhile we'll show them off for you. I still haven't been brave enough to get one.

I hope you are having a great Summer. I hope your garden and your bees are going strong. Enjoy!

I'm a beekeeper in Gila NM. My wife, Jo Dee had this tattoo done to show that she is "The Queen Bee". No requeening this one. Robby Birch

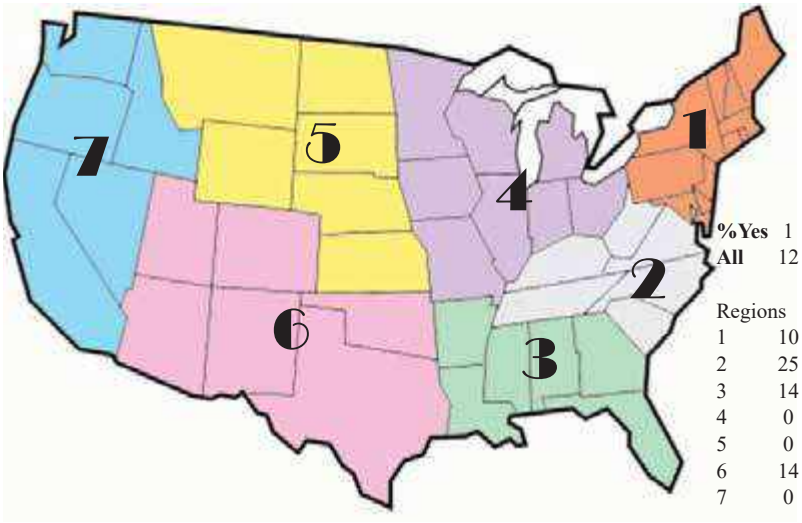
I got this a few years ago. It is on the inside of my arm between my wrist and elbow. I really enjoy the detail of this piece. It is my favorite of my tattoos. Amy Colgan

Anna Olver

A server at a local Medina restaurant.

Hoody Summers

JULY – REGIONAL HONEY PRICE REPORT



%Yes	1	2	3	4	5	6	7	8	9
All	12	42	58	27	10	26	94	78	33
Regions									
1	10	52	57	29	14	33	100	90	48
2	25	33	67	0	8	17	75	75	33
3	14	50	64	29	7	21	86	79	21
4	0	29	57	43	29	0	100	86	14
5	0	14	57	0	0	14	100	71	14
6	14	50	71	36	7	36	100	57	29
7	0	33	100	100	0	67	100	100	0

Honey Labels

We surveyed our reporters this month asking about the labels they use on their honey jars. We asked yes or no if they used these features. The graph below show overall YES answers, and below for each region. We asked if the following attributes were on their labels:

1. Product of U.S.
2. "My" state
3. Local Honey
4. Varietal – i.e., goldenrod or locust
5. Seasonal – Spring blossom, autumn gold
6. Use a top label to tell any of these
7. Name and contact info
8. Weight, pounds and metric
9. Warning about feeding infants
10. Even more? What else

If you've looked at the 2018 National Honey Report article already, you are aware of how much honey is brought into the U.S. from off shore, and how little it costs. Shelf price competition is fierce, and it's not getting better. The major advantage US beekeepers have is, of course, U.S. produced, plus a lot of opportunity for other, local information. But how do customers know it's from the US, local, varietal and the rest unless you are standing at a farm market booth and can tell them. It's the label. Period. The chart shows what our reporters are using, and the extras are added at the bottom. You can't sell if you don't tell. So tell your customers about you and your honey – on your label.

10. Other labels used: Raw, unfiltered, no HFCS, State Department of Ag approved on the label, Pure Honey, how to liquefy, Pure (State) Honey, Family Owned and Operated, Made by American Bees, Certified Naturally Grown (an organization that has requirements and restrictions you must qualify to claim).

Name and weight are almost universal due to state and federal laws, and local is common, but the rest are too often not used.

	REPORTING REGIONS							SUMMARY			History	
	1	2	3	4	5	6	7	Range	Avg.	$/lb	Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS												
55 Gal. Drum, Light	2.24	2.18	2.20	2.53	2.30	2.05	3.00	1.50-3.00	2.22	2.22	2.26	2.31
55 Gal. Drum, Ambr	2.16	2.11	2.11	2.47	2.16	1.85	3.00	1.35-3.00	2.14	2.14	2.13	2.20
60# Light (retail)	225.21	182.33	197.50	195.44	163.50	209.80	220.00	150.00-325.00	212.92	3.55	207.38	200.44
60# Amber (retail)	227.57	181.80	191.25	191.69	227.57	201.67	220.00	162.00-325.00	211.64	3.53	208.09	202.67
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	108.61	76.50	84.70	71.67	61.20	90.00	108.61	57.60-194.40	91.23	7.60	90.99	80.43
1# 24/case	129.12	111.70	130.77	128.96	134.00	115.13	128.40	45.00-211.20	130.13	5.42	136.10	119.69
2# 12/case	132.75	128.24	107.54	134.30	111.84	109.60	114.00	79.20-210.00	120.90	5.04	117.49	109.54
12.oz. Plas. 24/cs	111.83	117.31	110.29	89.00	83.76	106.74	103.20	66.00-172.00	104.66	5.81	101.78	94.77
5# 6/case	145.41	109.18	75.00	127.50	113.16	132.00	145.41	71.50-240.00	135.08	4.50	135.10	123.17
Quarts 12/case	181.62	145.31	145.96	140.80	162.04	164.63	144.00	109.20-300.00	158.64	4.41	155.39	146.74
Pints 12/case	90.35	90.80	86.00	80.67	111.00	91.54	84.00	60.00-120.00	90.70	5.04	90.67	96.13
RETAIL SHELF PRICES												
1/2#	5.22	4.57	4.68	5.05	4.28	3.76	5.22	1.98-9.00	4.95	9.90	4.97	4.96
12 oz. Plastic	6.92	6.12	5.82	5.67	4.59	6.26	5.90	3.50-12.00	6.09	8.13	6.04	5.87
1# Glass/Plastic	9.27	7.19	7.92	8.00	6.67	6.90	8.00	4.50-17.00	7.79	7.79	7.99	7.50
2# Glass/Plastic	14.73	13.24	13.40	14.85	10.49	12.31	15.25	6.89-25.00	13.52	6.76	13.42	12.39
Pint	13.41	9.47	9.80	13.91	9.50	9.98	8.40	4.00-29.00	10.33	6.89	10.88	10.51
Quart	19.82	17.19	16.18	18.78	15.82	18.58	18.15	8.00-35.00	18.14	6.05	18.28	17.59
5# Glass/Plastic	30.57	25.92	37.59	31.00	23.26	24.37	30.57	16.00-48.00	29.14	5.83	29.50	27.06
1# Cream	10.44	8.20	11.97	10.40	10.05	7.25	9.00	5.99-16.00	9.89	9.89	10.39	9.82
1# Cut Comb	13.00	11.08	12.24	9.00	12.33	10.50	14.00	5.00-24.00	11.51	11.51	11.18	11.28
Ross Round	9.51	6.96	9.51	10.00	9.51	10.50	12.49	6.00-13.00	9.52	12.69	9.62	9.32
Wholesale Wax (Lt)	7.07	4.25	5.10	7.09	6.13	5.13	6.00	2.50-12.50	6.64	-	6.66	6.44
Wholesale Wax (Dk)	5.49	3.67	3.70	7.13	5.49	3.17	5.49	2.00-9.50	5.23	-	5.33	5.49
Pollination Fee/Col.	97.45	74.50	64.00	93.33	97.45	133.50	97.45	30.00-175.00	92.39	-	90.17	86.91

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
- Treat for mites
- Feed
- Feed dry pollen in the hive
- Go into beeyards looking on ground
- Check for queen cells
- Put supers on hives
- Leave plenty of honey for the bees
- Change out supers
- Requeen
- Start nucs
- Treat with oxalic acid vapor
- Extract honey
- Check the electric fence
- Pull honey off August
- Check for stores to make it through the Winter

Region Two
- Feed
- Last month to change or re-queen from egg
- Mite control
- Feed sugar syrup if needed
- Monitor weather conditions to determine possible sugar water feeding needs
- Split hives/rebox to nucs
- Feed in preparation for winter
- Check for disease
- Do not take too much honey off
- Make sure hive is in good shape
- Treat for *Varroa* and hive beetles
- Remove supers
- Check Queens

Region Three
- Treat mites
- Combine weak colonies
- Check levels
- Feed pollen supplement
- Pull honey
- Requeen
- Split
- See that they have enough honey to make it through the Fall
- Begin feeding
- Remove rest of honey
- Pull full supers and replace them if nectar is still coming in
- Provide water

Region Four
- Check for mite numbers
- Control mites
- Leave ample supply of honey
- *Varroa* Monitor/treat
- Supers off- rest of honey is for the bees
- Arrange supers
- Make sure queens are confined to brood boxes
- Check all hives for laying Queens
- Harvest honey

Region Five
- Mite check
- Treat varroa
- Trap small hive beatles
- Add honey supers
- Have the honey supers off
- Requeen each colony
- Harvest honey & comb

Region Six
- Med for mites
- Look for/take honey off of hives
- Treat for mites
- Swarming check
- Feed
- Monitor weak hives- either build up or combine
- Try to protect hives from thieves
- Harvest honey
- Remove full supers and add empties

Region Seven
- Pollen Sub & Syrup
- Re-Queen with Nucs
- Remove supers
- Take mite samples
- Mite treatment
- Feed
- Mite med

Honey Reporters Wanted

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

U.S. Honey Industry Report – 2018

In past years we have provided this report in our May issue, following a February release of this data. However, due to the government closure this year, this report was not released until mid-May, 2019. Moreover, NASS has suspended collecting data from beekeepers with fewer than five colonies due to budget and program requirements. This data collection service was in its infancy, and provided valuable data for not only beekeepers, but the beekeeping industry in general. We are hopeful that the shut down and budget and program issues will be resolved so these valuable pieces of information can again be collected.

United States Honey Production Up 2 Percent for Operations with Five or More Colonies in 2018

United States honey production in 2018 from producers with five or more colonies totaled 152 million pounds, up 2 percent from 2017. There were 2.80 million colonies producing honey in 2018, up 4 percent from 2017. Yield per colony averaged 54.4 pounds, down 2 percent from the 55.5 pounds in 2017. Colonies which produced honey in more than one State were counted in each state where the honey was produced. Therefore, at the United States level yield per colony may be understated, but total production would not be impacted. Colonies were not included if honey was not harvested. Producer honey stocks were 29.1 million pounds on December 15, 2018, down 5 percent from a year earlier. Stocks held by producers exclude those held under the commodity loan program.

Honey Prices Down 2 Percent for Operations with Five or More Colonies in 2018

United States honey prices decreased 2 percent during 2018 to 216.6 cents per pound, compared to 219.9 cents per pound in 2017. United States and State level prices reflect the portions of honey sold through cooperatives, private, and retail channels. Prices for each color class are derived by weighting the quantities sold for each marketing channel. Prices for the 2017 crop reflect honey sold in 2017 and 2018. Some 2017 crop honey was sold in 2018, which caused some revisions to the 2017 crop prices.

Price Paid per Queen was 18 Dollars for Operations with Five or More Colonies in 2018

For operations with five or more colonies, the average prices paid in 2018 for honey bee queens, packages, and nucs were $18, $86, and $110 respectively. For operations with five or more colonies, pollination income for 2018 was $302 million, up 8 percent from 2017. Other income from honey bees for operations with five or more colonies in 2018 was $94.6 million, up 17 percent from 2017. These estimates along with expenditure and apiary worker information can be found later in this report.

Number of Colonies, Yield, Production, Stocks, Price, and Value - States and United States: 2017

[Operations with 5 or more colonies that also qualify as a farm. Colonies which produced honey in more than one State were counted in each State.]

Honey: Number of Colonies, Yield, Production, Stocks, Price, and Value by State and United States, 2018

State	Honey Producing Colonies[1]	Yield per Colony	Production	Stocks, Pounds Dec 15[2]	Average Price per Pound[3]	Value of Production[4]
	x1,000	Pounds	x1,000	x1,000	Cents	1,000 Dollars
AL	6	45	270	14	357	964
AZ	24	38	912	109	282	2,572
AR	28	50	1,400	84	187	2,618
CA	335	41	13,735	3,022	206	28,294
CO	31	48	1,488	283	202	3,006
FL	215	49	10,535	737	240	25,284
GA	98	34	3,332	200	279	9,296
HI	17	103	1,751	18	183	3,204
ID	96	31	2,976	655	196	5,833
IL	11	41	451	108	501	2,260
IN	7	46	322	106	375	1,208
IA	38	49	1,862	1,005	235	4,376
KS	5	73	365	95	300	1,095
KY	4	41	164	34	542	889
LA	45	83	3,735	261	190	7,097
ME	12	32	384	92	268	1,029
MI	92	44	4,048	729	237	9,594
MN	119	61	7,259	1,161	188	13,647
MS	20	87	1,740	70	205	3,567
MS	9	45	405	36	258	1,045
MT	160	92	14,720	3,680	192	28,262
NE	40	59	2,360	850	199	4,696
NJ	13	31	403	165	735	2,962
NY	56	48	2,688	833	334	8,978
NC	10	33	330	63	555	1,832
ND	530	72	38,160	4,579	188	71,741
OH	14	73	1,022	491	361	3,689
OR	93	35	3,255	1,009	222	7,226
PA	19	44	836	309	373	3,118
SC	16	48	768	15	304	2,335
SD	255	47	11,985	5,154	198	23,730
TN	7	46	322	84	399	1,285
TX	132	56	7,392	1,035	206	15,228
UT	26	41	1,066	75	209	2,228
VT	7	48	336	94	366	1,230
VA	4	40	160	35	683	1,093
WA	77	43	3,311	563	211	6,986
WV	6	37	222	38	416	924
WI	51	45	2,295	711	276	6,334
WY	39	56	2,184	175	189	4,128
Other States[5,6]	36	39	1,399	314	593	8,599
U.S.[6,7]	2,803	54.4	152,348	29,091	216.6	333,482

[1]Honey producing colonies are the maximum number of colonies from which honey was harvested during the year. It is possible to harvest honey from colonies which did not survive the entire year.
[2]Stocks held by producers.
[3]Average price per pound based on expanded sales.
[4]Value of production is equal to production multiplied by average price per pound.
[5]Alaska, Connecticut, Delaware, Maryland, Massachusetts, Nevada, New Hampshire, New Mexico, Oklahoma, and Rhode Island not published separately to avoid disclosing data for individual operations.
[6]Due to rounding, total colonies multiplied by total yield may not exactly equal production.
[7]U.S. value of production will not equal summation of States.

Per Capita Honey Consumption 2018

We calculate per capita honey consumption each year using data from UADA NASS, USDA ERS, The Farm Service Agency and the US Census Bureau. From these sources, we calculate the amount of honey produced in the US in 2018, how much was left over from 2017, and how much honey was imported into the US in 2018. We then calculate the amount of honey that was used during the year, figuring exports during the year, honey put under loan, and honey stored by producers in their warehouses. Essentially it's honey in minus honey out equals consumption, divided by the population on July 1 of that year. It's the same formula every year.

We make some assumptions. We have to. USDA ERS has a figure on per capita consumption of many commodities, and they use a somewhat different analyses. They do have measurements for such things as waste at home, unconsumed but purchased and like measurements that will make some small differences. And there are amounts of honey that are purchased by importers and handlers that are in transit so don't get counted this year but will be caught next.

Our numbers are pretty straight forward, however, in that we use the same identical sources each year, allowing for adjustments this year on changes made by the various government agencies calculated last year.

For a change this year, we provide both 2017 and 2018 charts for number of colonies, Production, stocks, price and value. It show trends and changes a bit better when you can see the actual numbers.

Per Capita honey consumption and the average price of all honey in the U.S. for the following years:

2010 – 1.20 pounds/person, @ $1.60/lb.
2011 – 1.27 pounds/person, @$1.73/lb.
2012 – 1.26 pounds/person, @$1.95/lb.
2013 – 1.44 pounds/person, @$2.13/lb.
2014 – 1.55 pounds/person, @$2.17/lb.
2015 – 1.51 pounds/person, @$2.09/lb.
2016 – 1.60 pounds/person, @$2.12/lb.
2017 – 1.83 pounds/person, @$2.16/lb.
2018 – 1.7 pounds/person, @$2.16/lb.

Honey Consumption, population, prices 2010 – 2018

Year	million lbs Honey in	million lbs honey out	millions population	lbs/person	Price/lb $
2010	398	29	307	1.20	$1.60
2011	470	80	309	1.27	$1.73
2012	487	53	312	1.26	$1.95
2013	500	49	314	1.44	$2.13
2014	547	56	318	1.55	$2.17
2015	544	58	321	1.51	$2.09
2016	573	55	323	1.62	$2.12
2017	600	435	325	1.71	$2.19
2018	592	40	327	1.70	$2.16

Figures this year for honey in:

U.S. Production this year was 152.3 million pounds, plus imports of 442.6 million pounds (down 1.1% from last year), plus stocks held over from last year of 29.1 million pounds while there are still 1 million pounds on loan yet this year. This is a total of 594.9 million pounds of honey into the U.S. market during 2018. That's compared to 596.6 million pounds honey in in 2017.

Net Honey Out for the U.S., 2018:

We exported 9.7 million pounds of honey last year, down just a tad from the previous year. We stashed away for a later date 29.1 million pounds, and we put a million pounds on loan, to be recalled at a later date. This comes to 39.8 million pounds of honey taken out of circulation, so to speak during 2018. That's down just about 9% from last year.

Now, total consumption is calculated by taking all the honey in, subtracting all the honey out. This gives a total honey consumption for the year.

Honey In =	594.9 million pounds
Honey Out =	39.8 million pounds
Total Consumption =	555.1 million pounds
U.S. Population July 1, 2018	327.2 million people

Per capita consumption – 1.697 pounds of honey per person, or 27.15 ounces per person in 2018. That's down a half teaspoon from 2017's 1.71 pounds per person, or 27.4 ounces.

Of the honey consumed in the US in 2018, 152.3 million pounds was produced in the US, and 442.6 million pounds was imported....total 594.9 million pounds. We imported approximately 75% of the honey we used this year, while 25% was produced here.

It's interesting to note the gradual increase in honey prices, and in amount of honey consumed over time. Total consumption over the years since 2010 has increased from 369 million pounds, to this year's 555 million pounds – a 35% increase over all. Meanwhile, per capita consumption has increased from about 1.2 pounds to 1.7 pounds per person – a 29% increase per person. So you could say that, yes, each person in the US is eating more honey each year, the real gain is because there are more people, about 7% more now than in 2010.

Honey Prices 2000-2018

Cents/lb.	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
All Honey	59.7	70.4	132.7	138.7	108.5	90.4	104.2	103.2	141	144.5	160.3	172.9	195.1	212.6	216.1	209.0	207.5	215.6	216.6
Retail Shelf	130.4	142.2	152.5	188.5	188.7	183.3	191.0	196.1	197.6	278.4	305.4	328.4	340.5	373.5	406.6	409.6	462.	477.7	421.2
%Difference	54%	51%	13%	26%	42%	51%	46%	29%	28%	48%	48%	48%	43%	43%	47%	51%	45%	45%	51%

Top Ten Producing States Each Year

2012			2013			2014			2015			2016			2017			2018		
State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	X1000 Col	X1000 Prod lbs	State	X1000 Col	X1000 Prod lbs	State	X1000 Col	X1000 Prod lbs
ND	495	34.2	ND	480	33.2	ND	490	42.1	ND	490	36.2	ND	485	37.7	ND	455	33.7	ND	530	38.2
SD	270	17.0	MT	159	14.9	SD	230	24.4	SD	290	19.1	SD	280	19.9	SD	255	14.3	CA	335	13.7
FL	199	12.7	SD	265	14.8	FL	245	14.7	MT	146	12.1	MT	159	12.2	CA	335	13.7	SD	255	12.0
CA	340	11.9	FL	220	13.4	MT	162	14.3	FL	220	11.8	CA	310	11.2	MT	145	10.4	FL	215	10.5
MN	130	8.7	CA	330	10.8	CA	320	12.5	TX	126	8.3	FL	215	10.8	FL	205	8.8	MT	160	14.7
MT	149	7.7	MN	130	7.5	TX	116	9.0	MN	122	8.2	TX	133	9.3	TX	120	7.9	TX	132	7.4
TX	95	4.9	TX	106	6.2	MN	132	7.9	CA	275	8.2	MN	124	7.3	MN	126	7.8	MN	119	7.3
MI	76	4.3	LA	50	4.9	MI	91	5.7	MI	90	5.2	MI	89	5.3	ID	95	4.2	GA	98	3.3
WI	63	4.3	WI	59	3.5	GA	73	4.5	LA	44	4.3	LA	50	4.3	LA	43	3.5	ID	96	2.9
LA	41	3.5	GA	67	3.3	LA	48	4.0	NY	58	3.5	GA	96	3.7	WA	77	3.5	OR	93	3.3
Total	1858	109.1		1866	112.5		1957	139.1		1861	117.4		1941	121.8		1850	107.8		2033	110.4
All Sts.	2624	144.4		2640	149.5		2740	178.3		2660	156.5		2775	161.8		2669	147.6		2803	139.9
% of Tot.	71%	76%		71%	75%		71%	78%		70%	75%		70%	75%		69%	73%		73%	75%

Where this honey is produced each year hasn't changed much by looking at the top 10 honey producing states chart. North Dakota reported having 19% of all the colonies in the US last year. It was rumored that last summer you could walk all the way across North Dakota stepping only on beehives and your feet would never touch the ground. That may be a stretch, but not by much. Those colonies produced fully 25% of all the honey produced in the US last year also. Comparatively, the bottom five of the top ten producing states produced only 16% of all US honey last year. Utah may say they are the beehive state, but North Dakota has the numbers to show they should be.

As an aside, sort of, we include also a chart here of some of the costs and incomes US beekeepers have, as measured by the USDA from 2015 – 2018. These numbers now are only for beekeepers with 5 or more colonies, and include basics like queens, packages, nuc, varroa control and feed costs, plus income from various sources, and number of employees. This now four year data set gives a picture of what's remained rather steady, and certainly what hasn't.

COST & INCOME				
	2015	2016	2017	2018
	5+	5+	5+	5+
Queen Costs	-	19	34	18
Pkg. Cost $	-	89	117	86
Nuc Cost $	-	117	138	110
Other Income x 1000	406.0	486.3	435	302.8
Varroa Control Cost/ Colony $	6.06	5.77	6.46	-
Workers x 1000	23	24	22	23
Feed Cost/Colony $	18.90	18.13	19.8	24.4

Coupled with that is the gradual value of the honey crop increase each year, while the number of colonies, and basically production remains essentially constant. The average number of colonies counted each year since 2010 is 2577. It remained below that until about 2010, then has been moving up a bit each year until 2018. With that has seen the increase over time of the value of the US honey crop. Couple these numbers with the basic message the media uses to make news, that is: Bees are disappearing. The real message is that beekeepers are working harder to keep, and even increase the number of colonies in the US to accommodate the increased demand for pollination, especially almonds, and to have adequate bee populations available to sell to other beekeepers.

Colonies and Value of Production		
Year	Colonies (million)	Value (million US$)
2000	2.620	132.8
2001	2.506	133.1
2002	2.574	228.3
2003	2.599	252.1
2004	2.556	199.6
2005	2.413	161.0
2006	2.393	158.4
2007	2.443	159.8
2008	2.342	232.7
2009	2.498	215.1
2010	2.692	285.7
2011	2.491	261.9
2012	2.539	283.5
2013	2.640	320.1
2014	2.740	387.4
2015	2.660	329.7
2016	2.775	343.0
2017	2.683	334.2
2018	2.803	333.5

The takeaway from these two charts is extremely clear. Costs to maintain colonies are variable, both by year, and by location. This isn't new. It costs more and takes more work to keep bees in some places, think northern Minnesota, than others, think Mississippi. That's a given. That costs in both of these places aren't steady or predictable is new, and is an ongoing issue for beekeepers. Profits, too, are unpredictable, and it is true that it is more expensive to control the ongoing issues of pests and deal with low level, but unrelenting pressures of agricultural pesticides, almost everywhere.

However, the numbers have another story that must not be neglected. Over an 18-year span the number of colonies has remained relatively steady, in spite of maintenance and replacement costs. Meanwhile the value of the honey, just honey, not packages, nucs or queens, has almost tripled.

Of course to stay in business income must increase to accommodate those increasing costs, and it pretty much does. It is unfortunate that there are not numbers to reflect income from the bees these beekeepers have sold. Packages certainly have gone up, but new players in the selling-bees game are selling nucs and complete hives rather than spend a lot of energy making honey that is, at best, barely profitable.

Value of Honey Imports into the U.S., by country, 2018, Million U.S.$

Argentina - $88.8
India - $83.2
Brazil - $81.6
Vietnam - $61.1
Canada - $ 47.9
New Zealand - $37.2
China - $20.0
Ukraine - $17.2
Mexico - $13.3
Thailand - $10.1
Turkey, Spain, Germany, Australia, and France total - $24.2
These countries total 96.1% of U.S. imports, 2018, with a value of $485 million

Exports from U.S. totals, 2018 (in metric tons)
2015 – 5,107
2016 – 5,047
2017 = 4,491
2018 – 4,398
Imports to US, 2018 totals (In metric tons)
2015 – 175,243
2016 – 166,477
2017 – 203,069
2018 – 200,760

That total import value, shown in the Value of Honey Imports chart, comes to $504.2 million dollars, compared to the value of U.S. produced honey last year at $333.5 million dollars. An interesting figure – 25% of the honey we consumed cost us about 40% of the total value of the honey we consumed.

In 2017 we imported 67% of the honey we consumed, so that number has increased this year, and with the prices available, it is, sadly, no surprise. Prices per pound bulk for imported honey in Feb this year look like this:

Argentina, $0.99 - $1.30 depending on color
Brazil, Organic - $1.25 - $1.37, depending on color
India, $0.87 - $$0.96, depending on color
Uruguay, $0.93
Vietnam, $0.81 - $0.89, light amber only

One country you will note that is not on this chart is China. Much speculation has arisen as to why…they once were huge exporters to the US each year, and still make some contributions ($20 million in 2018), even with tariffed honey sales. Argentina leads the pack this year, however, and has for a bit. Followed closely by India and Brazil. Notable decreases came from Mexico this year, down 54%, Vietnam down 53% and even Argentina was down this year over past years. When looking at average price per pound for US honeys across all states, the range is $1.83 - $7.37, with an average of $2.16. It's tough to compete on price alone when looking at these prices.

LOOKING AT SOME EXPORTING COUNTRIES INFORMATION

The countries below are gargantuan honey exporters to the world, accounting for more than three quarters of all the honey in the world that was exported last year, figured in U.S. dollar value.

China - $249.3 million (11.2 % of all exports) (In 2017, the last year we have data for, China exported to just 8 countries 48.3 million pounds of honey, worth US $222.4 million)

New Zealand - $245.2 million (11%) In 2018 New Zealand exported to the US 3.7 million pounds of honey with a US$ value of $18.6 million, or, that's $5.06 on average for every pound of manuka honey sent here.

Argentina - $175 million (6.3%)
Germany - $140 million (5.4%)
Mexico - $120.4 million (5.4%)
Spain - $107.3 million (4.8%)
India - $102.4 million (4.6%)
Ukraine - $98.2 million (4.4%)
Brazil – $95.4 million (4.3%)
Hungary - $86.7 million (3.9%)

Belgium, Vietnam, Canada, Romaina, Poland combined - $298.4 million (13.3%)

These 15 countries accounted for approximately 77% of all honey exports in 2018

(China's value is a result of sheer volume of honey exported)

Worldwide, purchases of imported natural honey totaled US$2.2 billion in 2018

Overall, the cost of natural honey imports declined by an average -3.3% for all importing countries since 2014 when natural honey purchases were valued at $2.3 billion. Year over year, imported natural honey retreated by -4.7% from 2017 to 2018.

From a continental perspective, European countries bought the highest dollar worth of imported natural honey during 2018 with purchases costing $1.2 billion or 52.3% of the global total. In second place were North

Honey Price by Color Class - U.S.: 2014 - 2018
[Producers with 5 or more colonies that also qualify as a farm]

Color class	Price														
	Co-op and private					Retail					All				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
	cents per pound					cents per pound					cents per pound				
Water white, extra white, white	204.6	189.0	185.1	189.1	197.3	328.5	354.2	490.8	380.1	379.8	206.2	191.0	192.9	201.6	200.1
Extra light amber	209.6	204.0	187.7	190.8	200.1	392.2	411.8	377.5	458.8	425.2	218.3	215.4	195.1	213.5	209.2
Light amber, amber, dark amber	208.8	198.8	189.4	194.8	205.7	417.1	398.4	436.4	484.8	473.3	234.2	230.5	224.8	232.2	240.1
All other honey, area specialties	255.4	238.3	244.0	245.7	259.6	535.2	647.0	792.8	624.2	690.0	317.2	330.3	385.6	373.8	347.9
All honey	207.1	195.5	188.1	192	201.1	405.4	409.6	462.0	477.7	421.0	217.3	209.0	207.5	215.6	216.6

American importers at 23.8% while 20% of worldwide natural honey imports were delivered to Asia.

Smaller percentages were sold to customers in Oceania (2.4%), Africa (1.1%) and Latin America (0.3%) excluding Mexico but including the Caribbean.

Below are the 15 countries that spent the most on imported natural honey during 2018.

1. US: $504.2 million (22.5% of total natural honey imports)
2. Germany: $305.7 million (13.6%)
3. Japan: $145.4 million (6.5%)
4. France: $129.5 million (5.8%)
5. United Kingdom: $128.3 million (5.7%)
6. Italy: $100.4 million (4.5%)
7. Belgium: $72.9 million (3.3%)
8. China: $70.1 million (3.1%)
9. Spain: $68 million (3%)
10. Netherlands: $66.9 million (3%)
11. Poland: $62 million (2.8%)
12. Saudi Arabia: $57.8 million (2.6%)
13. Australia: $52.6 million (2.4%)
14. Switzerland: $39.8 million (1.8%)
15. Hong Kong: $32 million (1.4%)

By value, the listed 15 countries purchased 81.9% of all natural honey imports in 2018. Within parenthesis is the percentage of overall natural honey shipments.

Among the above countries, the fastest-growing markets for natural honey since 2014 were: Australia (up 32.9%), Netherlands (up 32.6%), Japan (up 21%) and China (up 19.6%).

Those countries that posted declines in their imported natural honey purchases were led by: Saudi Arabia (down -32.9%), Hong Kong (down -17.1%), France (down -15.7%) and United States (down -13.4%

Some Individual Countries...

China

According to the National Bureau of Statistics, China's honey production has been increasing steadily over the years. In recent years, the domestic market share is growing. The following table lists the China's honey exports and the proportion of domestic sales in the period 2001-2016 (units: 10,000 mt).

Year	Total Output	Export	Proportion of Export	Domestic Consumption	Proportion of Domestic Consumption
2001	25.2	10.7	42.4	14.5	57.5
2002	26.5	7.6	28.67	18.9	71.33
2003	29.9	8.4	28.1	21.5	71.9
2004	29.3	8.2	28.0	21.1	72.0
2005	29.32	8.8	30.0	20.5	70.0
2006	33.3	8.1	24.3	25.2	75.7
2007	35.4	6.4	18.1	29.0	81.9
2008	40.0	8.5	21.25	31.5	78.75
2009	40.2	7.2	17.91	33.0	82.09
2010	40.1	10.1	25.1	30.0	74.9
2011	43.1	9.98	23.15	33.12	76.85
2012	44.8	11.0	24.55	33.8	75.45
2013	45	12.5	27.7	33.8	75.1
2014	46.82	13	28	33.84	72.2
2015	50.5	14.48	28.6	35	69.3
2016	70	12.83	18.3	40	57.1

This table shows that, in 2001, honey production was 252,000 mt, export 107,000 mt and about 145,000 mt were for the domestic market of consumption. By 2016, the yield of honey was 700,000 mt, and 128,300 mt were exported, the volume of the domestic consumption was about 400,000 mt, which is 2.75 times of the domestic sales in 2001. If each person buys 0.5 kg honey, over 1,300,000,000 Chinese people need over 650,000 mt, so the market potential is stunning!

In spite of the negative media coverage, China still exports considerable volumes of honey. The following table shows the exports to the main destinations in 2017, the latest data available.

Country	Value (USD)	Volume (kg)
Japan	73,056,708	30,109,142
UK (EU)	54,403,933	29,664,811
Belgium (EU)	25,164,242	11,389,802
Spain (EU)	17,820,548	8,897,182
Poland (EU)	17,595,171	9,087,237
Australia	12,997,760	6,406,581
Germany (EU)	10,733,514	4,936,745
Netherlands (EU)	10,723,586	5,498,740

Because of the many fake honey products in China, quite a few Chinese prefer to buy imported honey. The following table shows the import figures of the Chinese Customs regarding the 2013-2017 period, the latest available.

Year	Import (KG)	Amount (USD)
2017	5,660,034	91,297,418
2016	6,031,955	72,771,567
2015	6,517,661	74819215
2014	5,791,684	58,629,975
2013	4,856,713	42,932,079

This honey is respectively from New Zealand (Manuka), Australia, Germany, Thailand, France, Russia, Malaysia, Chile, Italy, Portugal, Swiss, UK, Spain, Canada, Greece, Taiwan Region, Kyrgyzstan, Brazil, Denmark, Mexico, Hungary, Poland

India

In India reports indicate that they are having a good crop for 2018 and as a result their prices have softened slightly from a year ago. In India, they produce their White/ELA crops first followed by Light Amber. Because packers are reported to have good coverage at this time offers for India honey have been slow. However, India's honey production has grown by 200%, exports by 207%

As per the latest data from India's National Bee Board, under the Department of Agriculture, the country's total honey production reported in 2017 - 2018 was 105,000 metric tons (MTs), compared to the 35,000 metric tons in 2005-2006. Today, India also has as many as 35 million bee colonies, compared to 8 million during 2005-2006. The number of beekeepers, beekeeping companies and honey societies has also increased and as of January 2019, the country had 9,091 registered people in the apiary business.

While the per capita honey consumption is as low as 50 grams per year in India, globally it ranges from 250 to 300 grams, with Germany topping in per capita honey consumption, with a whopping 4.4 pounds per year. In Asia, Japan is the biggest consumer of honey, with per capita consumption of up to 2 pounds per year.

With international demand for honey growing, India exports 50 per cent of the commodity and, in the last 12 years, exports have increased by 207 per cent.

Alongside production of honey, exports have also increased in recent years, with Germany, US, UK, Japan, France, Spain and Italy being the main markets. India, during 2017 – 2018, exported a total of 51,547 (MTs) whereas the exports were 16,769 MTs during 2005 –

2006," according to data from the National Bee Board.

The government plans to set up an Integrated Beekeeping Development Centre (IBDC) in every state and so far, there are 16 such IBDCs at Jammu and Kashmir, Haryana, Uttarakhand, Himachal Pradesh, Delhi, Punjab, Uttar Pradesh, Madhya Pradesh, Bihar, Manipur, West Bengal, Tripura, Arunachal Pradesh, Andhra Pradesh, Tamil Nadu and Karnataka.

Importantly, pollination by honey bees at vast farms and cultivable lands has increased crop yield manifold. Agriculture experts say the additional yield obtained after pollination is 15 to 20 times more than the money generated from the hive products. It has been proven that legumes, vegetables, fruits and other crops give better yield, ranging from 50 per cent to as high as 6,000 per cent, when crops are pollinated.

As per the latest government estimates, large-scale employment in the beekeeping sector is estimated to generate three hundred thousand man-working days by maintaining 10,000 bee colonies.

But climate change is beginning to impact beekeeping as honey bees in India are being hit by diseases and the recent harsh winter has affected nectar secretion in many parts of India.

Natural Honey Exports by Country

Following is information on several of the exporters of honey to the U.S. to gain perspective on the importance of each. Global sales from natural honey exports by country totaled US$2.2 billion in 2018.

Overall, the value of natural honey exports fell by an average 5.7% for all exporting countries since 2014 when natural honey shipments were valued at $2.4 billion. Year over year, global exports of natural honey decreased in value by 7% from 2017 to 2018.

Among continents, European countries accounted for the highest dollar value worth of natural honey exports during 2018 with shipments amounting to $876.1 million or 39.2% of total international honey sales. That percentage compares with 23% from Asian exporters, 15.5% from Latin America excluding Mexico but including the Caribbean, and 12.4% from Oceania (mostly New Zealand trailed by Australia). Smaller percentages came from shippers in North America (9.1%) and Africa (0.6%).

The 4-digit Harmonized Tariff System code prefix for natural honey is 0409.

Natural Honey Exports by Country

Below are the 15 countries that exported the highest dollar value worth of natural honey during 2018.

1. China: US$249.3 million (11.2% of total natural honey exports)
2. New Zealand: $245.2 million (11%)
3. Argentina: $175 million (7.8%)
4. Germany: $140.5 million (6.3%)
5. Mexico: $120.4 million (5.4%)
6. Spain: $107.3 million (4.8%)
7. India: $102.4 million (4.6%)
8. Ukraine: $98.2 million (4.4%)
9. Brazil: $95.4 million (4.3%)
10. Hungary: $86.7 million (3.9%)
11. Belgium: $77.7 million (3.5%)
12. Vietnam: $67.7 million (3%)
13. Canada: $61.2 million (2.7%)
14. Romania: $49.3 million (2.2%)
15. Poland: $42.5 million (1.9%)

By value, the listed 15 countries shipped over three-quarters (77%) of all natural honey exports during 2018.

Among the top exporters, the fastest-growing natural honey exporters since 2014 were: New Zealand (up 45.8%), Canada (up 33.1%), India (up 32.7%) and Ukraine (up 5.3%).

Those countries that posted declines in their exported natural honey sales were led by: Vietnam (down -49.1%), Mexico (down -18.1%), Poland (down -17.4%), Argentina (down -14.4%) and Spain (down -13.6%).

Argentina

In Honey news around the world, Argentina still appears to have an average to good crop this year. The Northern region evidently experienced some poor weather conditions but the main southern crop did not seem to be affected as much. However, the volume of white Argentine honey could be impacted which could affect the ratio of 34/40/50 in color honey that is sold. Reports are that the crop is delayed but there has been little demand at this time. In Brazil however, due to the recent good crops Organic prices continue to remain softer than a year ago due to the additional inventory they are carrying.

Argentina is the second largest producer of honey in the world, but its bees are dying at a rate of 30% every year, according to the Centre of Investigation on Social Bees (CIAS). It was made clear in 2018 that Argentina's economy depended heavily on crops and exports, as one of the worst droughts in recent years caused the country to lose US$7 billion, pushing it even further into the economic crisis emblematic of the past year.

The Food and Agricultural Organisation (FAO) stated that Argentina is the third-largest exporter of honey across the globe, and with honey production in massive decline in the South American country, this could have unwanted negative consequences on the economy.

However, a reduction in the bee population due to disease and pesticides is not only going to affect the production of honey. Bees are indispensable for pollinating a plethora of plants and crops. They pollinate 70 of the 100 crop species that feed 90% of the world, and are responsible for $30 billion a year in crop production.

Canada

In Canada the early reports indicate that the Canadian crop would be in the 70-80 MT range were understated as their crop is now being projected in the 90-93 MT range which is similar to the past 2-3 crops. For this reason there was still inventory available in Canada with their prices remaining somewhat soft although slightly firmer than Argentine prices. Due to fairly good demand for Canada honey the past few months much of their inventory has now been depleted but the exchange rate is still fairly favorable so prices have remained stable.

Canada is a significant exporter of honey to the U.S., and, certainly a close neighbor. They produce on average just over 40 metric tons per year, with Alberta producing almost half of that annually. They have just short of 800,000 colonies, again with Alberta at about 300,000, run by nearly 11,000 beekeepers.

The EU

The EU also plays an important role in the international honey game. They are major importers of honey, and, with the status change in Chinese imports into the US, the EU has absorbed much of what used to be sold ⇨

here. In 2018 they had 17.5 million hives, run by about 650,000 beekeepers, with Estonia leading the way with 3 million hives. Overall, the EU is about 60% self-sufficient, with imports needed to cover local demand. The main suppliers are China, with about 40% of that market, and the Ukraine with about 20%. Even so, the EU is the second largest honey producer in the world after China at 230,000 tons.

EU Imports, 2018 (in tons)	Value in Euros/Kg
Uruguay – 4550	2.26
Brazil – 4587	3.34
Cuba – 4974	2.4
Chile – 7540	2.96
Mexico – 20,860	2.82
Argentina – 25,405	2.34
Ukraine – 40,997	1.83
China – 80,242	1.3
Internal and Others – 225,669	2.17

Global Import and Export Markets

If a country is looking for a market for honey, or, is looking to expand it's beekeeping and honey production industry, they first need a place to sell that honey over and above internal consumption. Below is a list of net importers…that is, they buy more than they sell, thus creating a positive market for other countries. These are the highest negative net exports for natural honey during 2018. Investopedia defines net exports as the value of a country's total exports minus the value of its total imports. Thus, the statistics below present the deficit between the value of each country's natural honey import purchases and its exports for that same commodity.

1. United States: -US$478.7 million (net export deficit down -14.6% since 2014)
2. Germany: -$165.2 million (down -3.4%)
3. Japan: -$145.1 million (up 21.2%)
4. France: -$97.5 million (down -19.2%)
5. United Kingdom: -$94.8 million (down -14.3%)
6. Italy: -$69.9 million (up 56%)
7. Saudi Arabia: -$50.5 million (up 0.6%)
8. Netherlands: -$48.6 million (up 18.9%)
9. Switzerland: -$33.4 million (up 3.4%)
10. Hong Kong: -$28.7 million (down -10.9%)
11. Sweden: -$23.6 million (up 19.4%)
12. Australia: -$20 million (up 60.4%)
13. Poland: -$19.5 million (up 294.5%)
14. United Arab Emirates: -$19.2 million (down -25.5%)
15. Singapore: -$16.4 million (down -9.7%)

United States has the highest deficit in the international trade of natural honey. In turn, this negative cashflow confirms America's strong competitive disadvantage for this specific product category but also signals opportunities for natural honey-supplying countries that help satisfy the powerful demand from American consumers.

The following countries posted the highest positive net exports for natural honey during 2018. Essentially, these are the world's honey sellers. Investopedia defines net exports as the value of a country's total exports minus the value of its total imports. Thus, the statistics below present the surplus between the value of each country's natural honey exports and its import purchases for that same commodity.

1. New Zealand: US$244.9 million (net export surplus up 46.1% since 2014)
2. China: $179.1 million (down -11.2%)
3. Argentina: $175 million (down -14.4%)
4. Mexico: $120.4 million (down -18.1%)
5. India: $99.2 million (up 31.6%)
6. Ukraine: $98.1 million (up 5.6%)
7. Brazil: $95.2 million (down -3.4%)
8. Hungary: $86.7 million (up 0.2%)
9. Vietnam: $65.5 million (down -50.5%)
10. Spain: $39.3 million (down -36.8%)
11. Bulgaria: $38.8 million (down -0.6%)
12. Romania: $37.8 million (down -17.8%)
13. Canada: $32.4 million (up 92.1%)
14. Chile: $29 million (up 5.7%)
15. Turkey: $25.6 million (up 35.8%)

New Zealand has the highest surplus in the international trade of natural honey. In turn, this positive cashflow confirms the Oceania island nation's strong competitive advantage for this specific product category.

Watch This Space

The numbers shown here are not surprising by any degree. That's too bad, because some game changing management practices are even today occurring in the US honey market that will have an effect on these numbers in he next few years. Chief among them is the not-so-gradual shift from honey production income to pollination income coupled with the sales of bees income in the U.S.

Beekeepers figured out some time ago that the battle of honey prices from off shore is going to be both difficult and competitive when it comes to price, but for a time there was no alternative. And, unfortunately, quality isn't a major factor in the honey game. Imported honey, for the most part, is acceptable to US customers, as shown by steadily increasing per capita consumption. So, if you can't sell honey at a profit, then sell what you can sell and make your profits there. And pollination, fortunately, can't be imported, so there is definitely growth in that sector. Crops needing pollination, especially almonds but certainly other crops, are stable to increasing, thus demand for colonies is the same. That's a good thing.

To accommodate increased demand for pollination colonies, and, at least for awhile the increased demand from the sideline and hobby market for bees, beekeepers are looking at producing….just bees. And, like pollination, you can't import those, either. It's easier than honey, too. You don't have to worry about honey and mite treatments interfering with each other, and you can balance the needs of pollination with the ability to sell those extra bees afterwards. Win, win.

Coupled with this is the growing use of indoor wintering technology. And, basically, technology in general. Beekeepers, and beehives, are getting smarter about environmental manipulation and control, and keeping bees alive in northern Minnesota may be a bit easier in the not too distant future. Stay tuned for that.

Tariffs, too, are playing some role in honey prices and availability but that promises to be only a short term benefit. But any is better than none, so watch that front also.

So, production up, which is good, especially when prices are down, but imports continue to be a sharp pain if you are in the honey business. Selling bees for pollination and to meet the demand for more colonies seems to be a brighter future for US beekeepers. Watch this space. BC

In March, 1875, I received from Fred Weiss a box of comb "foundation" which I found beautifully accurate and perfectly flat. Although the weather was frosty at the time, I determined to make a practical test of it and accordingly fitted a sheet of the foundation into a frame and placed it in the center of a strong colony. I put a feeder full of syrup over the frame and then packed clothing over the whole, nearly filling the upper story. After 48 hours I found the feeder empty and beautiful cells raised nearly full length from the wax sheets. Mr. Weiss used enough wax in the sheets to make nearly if not quite the entire comb.

In August, 1875, I procured of Mr. Long ten pounds of his comb foundation. I made several very careful experiments and was well satisfied that the bees would draw out the most beautiful light combs in much less time than it took them to build new and what is still more important, they would make the entire comb from the material furnished in the foundation. I determined this by giving them a comb or sheet made of two different pieces, one of white and one of yellow wax. The cells, when drawn out to their full length, were of the color of the original foundation clear to the top. The white sheets furnished by Mr. Long were drawn out into combs of a delicacy; whiteness and beauty that made the finest specimen of comb made by the bees alone look cheap and awkward in comparison.

Comb Foundation a Success

All of my experiments with comb foundation resulted quite satisfactorily in favor of the foundation, particularly because the bees would draw out the wax into beautiful cells on an amount of feed that would not induce them to build comb at all. I had great hopes that by its aid combs of honey might eventually be furnished at something like the price of extracted honey. Frequently nice comb honey was spoiled by a piece of old tough comb that had been used as a guide. The foundation made the most beautiful white delicate guides that could be imagined and these were very easily fastened in the boxes.

In the January, 1876, number of *Gleanings* I gave directions for making copper dies for pressing wax to make comb foundation. The impression of each cell was formed by molded type held temporarily in plaster paris until they could be soldered in one solid piece. With these dies I succeeded in making wax cells deep enough for a queen to deposit eggs. To get the wax sheet I simply dipped a board in cold water and then in melted wax.

The First Foundation Mill

Making comb foundation with plates was such a slow laborious operation that I set the best mechanic I could find at work to make a machine for making foundation by means of metal rollers. He began work on this early in 1876.

By February 26, 1876, the metal rollers were finished and they were a complete success. The machine cost a good deal of money and I could see that still more would be required to get the wax in the proper shape rapidly enough. The impressions of the bottoms of the cells in the rolls were made by striking them one at a time with different shaped punches, yet they were made with such astonishing accuracy that we could make cells with the bottom nearly as thin as a soap bubble. The thinnest foundation that we had had up to that time from Mr. Long was 5-1/3 square feet to the pound, but at our first trial with the foundation rolls we made eight square feet to the pound and the walls were clear and sharp. We could roll out one continuous sheet a foot wide and a mile long if we wished.

"To which end we also pray always for you, that our God may count you worthy of your calling, and fulfill every desire of goodness and every work of faith with power; that the name of our Lord Jesus may be glorified in you, and ye in him, according to the grace of our God and the Lord Jesus Christ."
– II Thessalonians 1:11-12

THE STORY OF A.I. ROOT

The First Foundation Mill

A.I. **Root**

Comb Foundation Made of Paraffin

In June, 1876, I was filling orders for comb foundation made of paraffin. In my experiments to determine what would give the paraffin the requisite elasticity I recalled that the bees added propolis to their wax when they wanted it very strong and as it would have been a hard matter to furnish as much white and tasteless propolis as I needed I thought of a favorite gum of childhood days – Burgundy pitch. I found that this added to the paraffin in very small quantities gave just the tenacity need.

The paraffin and Burgundy pitch comb foundation did not prove a success after all. I had made and sent out a hundred pounds or more of this foundation and for fear a part of it at least would not prove satisfactory I gave notice that all those who had had trouble should send in their bill for damages and I would either refund the money or send better foundation. I had to discard the Burgundy pitch because it required so large a quantity as to darken the wax as well as to communicate a perceptible taste to the paraffin.

I began mixing beeswax with paraffin and made beautiful foundation. In fact, everything worked as nicely as I could desire until some very hot weather came on the 13th and 14th of June, when I found the cells stretching downward into ovals instead of hexagons. It was really amusing to see the troubled look on the countenances (?) of the young bees as they surveyed their work after repeated attempts at patching up and repairing. The sight of their discomfiture created some merriment, but I gave a faithful promise to the bees that hereafter they should have material that would stand the proper degree of heat.

Foundation with Extra Large Cells

I made plates and tried comb foundation just one-half

larger than drone comb. It evidently puzzled the bees for they tried to follow the angle and still make worker combs. They actually did make worker comb, but with three-cornered vacancies filled with wax.

To Prevent Sagging in Foundation

In 1877 I had found that almost all specimens of wax would sag more or less, though the white was worse than the yellow. It is necessary to cut the sheets so that they do not quite touch the bottom-bar. All the combs must be fastened ultimately to the bottom-bar, but they should not touch it until they are finished.

Very much depends upon the kind of wax used. If the wax is hard and firm even in warm weather, there is very little sagging and the darkest-colored wax frequently stretches the least. Years ago I had what I had reason to think was pure beeswax that was so soft that my finger could be pushed into a cake during warm weather. By avoiding wax like this I could make foundation that would sag so slightly as to be practically perfect.

In the early '70s, to entirely prevent sagging of the foundation in the brood-chamber, I tried making foundation on cloth or paper and succeeded very well with thin tissue paper, but all my experiments on cloth, even with the very thinnest I could get, were failures, simply because the bees would occasionally get hold of a thread and then would tear the cloth all out, apparently thinking it a moth web.

I obtained some very fine book muslin and also tried tracing linen, but although I could make beautiful foundation on both, the cloth made the base of the cells so much thicker than when I used wax alone, that it added to the weight and consequently to the expense.

While bees will work in combs made of metal when coated with wax I found that they are very apt to pick at paper or cloth and finally tear it out entirely. In 1875 I had combs in use that were built on very thin paper dipped in wax and pressed in dies to make the impression of the bottom of the cells. I tried almost all kinds of twine incorporated in the wax; but although I made repeated experiments, I discarded everything of the kind. Even though the bees let it alone for a short time, they were pretty sure to tear it out when the yield of nectar ceased.

However, I succeeded perfectly in making foundation on boards about an eighth of an inch in thickness, my chief difficulty being in getting these boards perfectly coated with wax on which to make the foundation. But the plan took too much wax for flat-bottom cells and I could not devise a satisfactory method of indenting the thin board's just right.

In February, 1879, J.Y. Detwiler, of Toledo, made me a visit, bringing some sheets of tin-foil. These were dipped in wax and run through the mill, making a foundation which he assured me was a perfect success. I did not doubt that the bees would build comb on this, but I did not quite like the idea of metal at the bottom of the cells and there was the extra weight and expense besides. It was of course proof against sagging.

There were a large number of experiments running over quite a period of years in the late 70s and early 80s regarding presses for making comb foundation, in which wires were incorporated to prevent stretching. However, I found all such foundation was much more brittle to handle than that made on rolls; in fact, one was very much disposed to get out of patience in trying to handle it after handling that from the rolls.

Making Continuous Sheets of Wax

The work of developing the comb foundation, like other new inventions, was a sort of groping in the dark for scarcely a month went past that some improvement was not made. One afternoon in the Summer of 1878, while thinking of the inconvenience of dipping boards and peeling the wax off, I had visions of a large pair of metal rollers made hollow with a stream of cold water kept running through them to keep them cool, these rollers dipping into melted wax so that a sheet could be rolled out on the other side a mile long if desired. This dream actually came true though, of course years later. BC

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BEE TALK

Send us your questions, we'll find the answers. Our regulars and our guests will share what they know. Send your questions to Kim@BeeCulture.com, with BEETALK in the subject line. This month's guests include Dewey Caron, author of several books and many articles, and Denzil St Claire, who helps run QueenRight Colonies, right here in NE Ohio and Gerald Hayes.

Question 1

I've heard that making splits in mid-Summer is a good way to control *Varroa*, but I'm not sure why that works, or what's the best way to do this. Can you share why now is good, and how to do this with strong, honey producing colonies? I live in the upper Midwest.

I wouldn't say that a mid-Summer split is a good way to control *Varroa* on its own in the long run, but I do believe there are factors at work in a mid-Summer split that can help to control *Varroa* in the short term. The original colony that the split is made from benefits some from the removal of whatever mites are in the brood and on the bees used to create the split, and by using newer comb to replace the old combs that are removed in the split making process. The split benefits from a break in the brood cycle as the new queen gets up to speed and the fact that it does not have time to build up into a large colony before Winter. Research and experience has shown that less populous colonies with small brood nests tend to have fewer mites and better survival rates than large colonies. As in most all things in beekeeping there are numerous ways to go about creating mid-Summer splits, and they often require that the split be fed at some point during the Winter or early Spring. *Ross Conrad, VT*

As a rule of thumb 2/3rds of ALL *Varroa* mites in a colony are doing their best to survive and grow and so they are sheltered behind capped cells reproducing on larva and pupae. If you can break that cycle by splitting a colony and minimize the amount of brood then honey bees can out-reproduce *Varroa* as *Varroa* needs them to grow and prosper. It is a fine line between building a colony that has many new workers and not having those workers having been a food source for developing *Varroa*. A honey bee colony can be a *Varroa* nursery. Good time to use a *Varroa* control product as referenced in the 'Tools for *Varroa* Management Guide' as well. *Gerald Hayes, MO*

The reason this would reduce *Varroa* is because you are starting your brood cycle over at about the time that *Varroa* levels start to peak while the colony levels start to decline, passing the tolerance threshold. Once you hit that reset button, the *Varroa* don't have the bee brood to reproduce and it halts their growth. It also gives new queens a chance to build up populations for winter survival and take advantage of fall flows. I am not a fan of this myself unless you want larger colonies for the next year, and have plenty of big hives already to go through the current year because you have to feed them fairly significantly in my area from June until late August because of dearths. It's just adding more colonies to take care of here. For the midwest, you may have more floral production than we do in NC. *Jessica Louque, NC*

The most important thing to consider with Summer splits is the honey flow in your area. If your flow is earlier (e.g. ends in beginning of July), you can make splits right after. If your main flow is in the later part of the Summer it might be hard to make splits without losing a lot of honey. I live in an area where I get a lull in nectar flow through August, and goldenrod is unreliable, so I often make Summer splits for varroa control. I first take off the honey, and then I split the colony, leaving the old queen in the original location with two frames of open brood, and making split with all the capped brood, giving it a queen cell. For good measure, both can get an oxalic acid dribble treatment. The old queen right after the split, and the young queen after she comes back and starts laying. *Meghan Milbrath, MI*

Question 2

I've had nothing but trouble with my queens from packages this year. The first queens never made it out of the cages before they died (or were killed). Requeened (in a manner of speaking) all them and they were released – I kept them in for 10 days before releasing them – and inside three weeks they had all been replaced and there were more queen cells than bees in most of the package colonies. I tried one more time, and the queens are still alive (Mid-May), but just not producing eggs the way my established queens are now. What gives?

As difficult as it is to diagnose beekeeping problems, it is even harder to diagnose from afar. Pesticide exposure, poorly mated queens, queens shipped before they began to lay, or to soon after they began to lay, queen exposure to temperatures that were too cold, or too warm during shipment, poor nutrition, and use of old comb contaminated with pathogens are just some of the possible issues that could be contributing or causing your experience. *Ross Conrad, VT*

Commercial package and queen producers many times ship queens that have not mated or have mated incompletely. Think of this; in producing queens lets say the queen producer is doing 1000 queens per week. Data says you need about a min. of 17 or so Drones to mate completely with a Virgin queen so you get a fully mated queen. How does anyone provide 17,000 drones per week? Many queen breeders are kicking off 5-10,000 queen virgins per week at the height of the season. So, they ship virgins to you hoping they will mate at your apiary. And if the virgins are too old or your weather is crumby or you have few drones in a DCA that is exactly what you experienced. *Gerald Hayes, MO*

I am a little confused by this because if you had packages with failed queens, how did you have queens or eggs to produce queen cells on the second release? Also, how did you keep them in before release for 10 days? Do you mean you yourself opened the queen cages? Or you kept the hive closed for 10 days? Either way, if the queens were not released on their own by workers, they were not going to accept her in the first place. I'm not sure how many packages you are dealing with, but it sounds like you might be better off talking to your package producer and explaining what you did and either get their advice or find a new supplier for the next year. *Jessica Louque, NC*

In my experience, 10 days is much too long to keep them in before releasing them. Depending on how far the package has traveled, you can often release the queens when you install the package – if it has been on the road for two days, you can count that time towards acclimatization. In splits, or when introducing a new queen, I usually put her in a cage for three days, and then manually release her. *Meghan Milbrath, MI*

Question 3

This is my first year, and I live in the South East. Local beekeepers tell me that by July the honey flow is over, and beekeeping is done for the year. Can that be? What do I do to keep my bees alive until next Spring? What do I feed, how do we overwinter, help!!!

Lots of questions here which is common in one's first year. When the rains end, the honey flows dry up whether your down south or up north. To keep bees alive, do not over harvest their honey and leave plenty for them to weather the time of dearth. If there is not enough honey to leave for the bees, start feeding and keep feeding until the hive has a super full of honey stored above the brood nest prior to the onset of cold weather. *Ross Conrad, VT*

Let me answer this in a generic way, because I don't keep bees in the Southeast. Monitor and/or treat for *Varroa* mites. Those little buggers will sneak up on you, and once they get out of control, they'll bring down a hive faster than you can say "Jack Robinson!" Make sure your little darlings have plenty of honey. If they run short, you can always feed sugar syrup – two parts white refined sugar to one part water (by weight or by volume, works out the same). *Ed Colby, CO*

Honey flow from natural flowers may be over due to hot weather so you can collect an excess of honey but there are always flowers around to keep things going generally and in fall it picks up again. This is your job as the beekeeper manager to monitor your colonies for all you need to do. And at times this may require you to supplementally feed. *Gerald Hayes, MO*

Our bees are in NC, and we run our giant studies based on this fact because there is a dearth. To be honest, the honey flow is essentially done for the year in June most of the time. We will get a Fall flow in late August into September, but it's mostly just enough to add some overwinter weight to your colonies. If you feed them through July and August until the flow, they should be okay. We feed a 1:1 and a bigger colony will take a gallon or two a week during this time. *Varroa* control is also essential, although that's not particular to our area. Do a mite check in late August or September and treat appropriately, and then check again. We've had issues in the past where trusted varroacides did not provide the efficacy expected and had to treat again. In October, check your honey stores and feed again if you need to. Drop them down to as few 10 frame boxes as you can (a triple into a double, a double into a single, etc) with as much food as possible. Throw an IPM board in the bottom or get a solid bottom board, minimize the entrance, and hope for consistent Winter weather! *Jessica Louque, NC*

It is important to distinguish honey flow from incoming food. There are times when you will have a strong flow - meaning that there is a lot of a particular plant in bloom, and you can make a crop. When that flow is over, there may still be enough food coming in to sustain the colony, though not enough to put away a crop of honey. To know if your colony needs to be fed, look to see how much food is coming in - is there nectar and pollen in the hive? Also, take the time over the next few years to record when things are in bloom, and when you see a lot of nectar coming in. It will help you understand the flows in your area. Also consider putting a scale on one of your colonies, as you can see by the weight when nectar is coming in, or when they are eating through their stores. *Meghan Milbrath, MI*

FOUND IN TRANSLATION

Magic Bullets For Mites

Jay **Evans**, USDA Beltsville Bee Lab

Varroa mites remain enemy number one among the living threats to honey bees. This is despite decades of attempts to understand and control these mites in Europe, then the Americas, and now across most of the beekeeping world. A prominent bee research professor told me in the early 2000s that the *Varroa* mite issue was under control, new chemical treatments were doing the trick and the mite would soon be vanquished. This was comforting to me at the time, since I had been hired to research American foulbrood disease. I was beginning to suspect that AFB was a 1950s sort of issue for beekeepers, who had just received word that small hive beetles were spreading and who seemed quite focused on mite impacts. Almost 20 years later, that professor has long retired and *Varroa* mites did not follow his suggestion.

A key strategy for reducing *Varroa* impacts is to interfere with female mating and reproduction. Coupled with hygienic behavior and controls aimed at vulnerable, exposed, female mites, reducing female reproductive success can greatly reduce the threats of *Varroa* mites at the colony level. This is due to the fact that *Varroa* females really aren't that productive, rearing at best a few female offspring in each reproductive round and generally, at least in worker cells, producing just a couple new mites. If reproduction can be reduced by even a fraction, this will help cap mite levels late in the season, when mites become filthy circulators of bee viruses.

Benjamin Conlon and colleagues have made a major breakthrough in the identification of potential features of bee physiology that put a lid on mite reproduction. In their study ("A gene for resistance to the *Varroa* mite (Acari) in honey bee (Apis mellifera) pupae", *Molecular Ecology, in press,* **DOI: 10.1111/mec.15080**), the authors used a mapping strategy to identify a high-value target for bee breeding.

As with most scientific breakthroughs, the study required luck, insight, and collaboration across several research groups. The luck came in the form of a honey bee population in Toulouse, France, that showed an extremely high frequency of failed mite reproduction. The insight came in only screening male honey bees from that population. Besides just targeting the sex that is most attractive and supportive of *Varroa*, the focus on males allowed these researchers to use a fascinating trait of honey bee biology to speed the search for genetic resistance.

Male honey bees are haploid from birth to death. Unlike female queens and workers (and ourselves for that matter) male honey bees have no father and every cell in their bodies holds chromosomes that are a genetically identical copy of the egg that gave rise to that individual. This is golden for genetic trait analysis, since traits cannot be masked by variants on an alternate chromosome and as such are fully exposed to view. It is also golden for breeding since, once identified in a single male, a trait can be bred in an invariant way into every queen and worker who that male fathers (through the wonder of instrumental insemination). Double golden and a rarely exploited tool for bee breeding.

More luck came in finding a single colony in which half of the males were conducive to mite reproduction while half stymied female mites. For the latter half, all female mites emerged, if they emerged at all, with no offspring. If you remember Mendel and his peas, or some other lesson from a distant genetics class, this perfect 50/50 ratio suggests that the trait of interest, here a 'something' that keeps mites from starting a family, is most likely driven by a single gene. Triple golden, since forcing a single gene variant into a population and keeping it there by breeding is way easier than juggling dozens of genes each of which plays a minor role, the bugbear of breeding schemes in bees, plants, and livestock.

One last fact of bee biology worked to the advantage of these authors. Across most of the tree of life, when a female generates the haploid (single set of chromosomes) eggs that will be fertilized with a male-sourced similarly haploid cell (sperm, pollen, etc.) to make a diploid (two-copy) offspring, there is a substantial amount of sloppiness between the two pairs of chromosomes that give rise to these haploid sex starters. This leads to crossing over (recombination) and a general reshuffling of the paired decks of genes held by both mom and dad. Reshuffled decks help expose new combinations of traits to selection, a phenomenon thought to be the key driving force for sex in the first place (don't worry I will mention hormones too, below). If you find this primer on egg production confusing, or boring, just remember one thing, honey bee eggs reshuffle their decks at a rate tenfold higher than almost all other forms of life (a jaw dropping rate of 20 centiMorgans per million base-pairs for those who really liked the preceding paragraph).

The impacts of this high recombination rate on honey bee health, let alone the reason it exists in the first place, are hot topics of debate. What is not debatable is that this high recombination rate is a lifesaver for scientists trying

to map the key genetic features of bee biology. By chopping bee chromosomes into an aggregate of really short linked chunks from mom and dad, this means that various chunk-identifying techniques (worthy of Nobel Prizes in 1933 and 1978) can map traits to extremely small regions, even single genes. By scoring a mere 45 (haploid) drone bees that is exactly what the authors did, finding that resistance was most likely caused by mutations in a single gene that makes a protein called MBlk-1 (Mushroom body large-type Kenyon cell-specific protein-1, for you details freaks). It would be hard to predict a protein that is a better candidate for messing with mite reproduction than Mblk-1. This protein, despite the pretentious name, is actually produced in many bee cells, including the fat body which was recently shown to be the major food source of *Varroa* mites (Ramsey et al., 2019,**doi:10.1073/pnas.1818371116**). More importantly, Mblk-1 is a huge enabler, that takes a change in hormone levels (i.e., the molting hormone needed to finish off a bee's transition from larva to adult) and sets in motion numerous events that help turn a pale grub into the bees we see emerging from capped cells. These changes, of course, are all happening exactly when *Varroa* mites are doing their reproductive business.

The authors suggest that the changes driven by a mutated MBLK-1 somehow throw off mite females. Perhaps mites don't get a particular smell needed to warm their ovaries? Perhaps they do not receive a vital nutritional component, or something produced by the mutated bees they are feeding on is toxic to them? Or maybe honey bee workers notice and hygienically remove bees with mutants for this protein? However the mechanisms shake out, this trait, which arose naturally in honey bees under intense mite pressure in France, is a very attractive target for breeding. Still, in order to make this more than a good-news story for one beekeeper in Toulouse, much more needs to be resolved. Are these mutations bad for bees? Do they work for female (worker)-destined pupae? Can mites evade this suppression as they have done for human-made attacks?

I am almost naive enough to declare victory on mites, but will not do so until more of these fundamental questions are answered. It will also help to see how this protein behaves in Asian bees and against Asian *Varroa* mites. MBlk-1 levels are turned up in parasitized (drone) bees in *Apis cerana* (T. Ji and colleagues, 2014, "Transcriptional responses in eastern honeybees (*Apis cerana*) infected with mites, *Varroa destructor*. *Genetics and Molecular Research, 13*(4), 8888-8900, **https://www.geneticsmr.com/articles/3664**"), suggesting some sort of role there, or at least a response to mite attacks.

While this is not the first study to use the power of honey bee males to identify traits, nor is it the first to exploit the honey bee genome (see the latest on that in a paper by Andreas Wallberg and colleagues, "A hybrid de novo genome assembly of the honey bee, *Apis mellifera*, with chromosome-length scaffolds. *BMC Genomics, 20*(1), 275. **doi:10.1186/s12864-019-5642-0**"), it is exciting because it marries the two so well and it does so by tackling a terrifying threat to honey bees. No promises, but (wink, wink) keep an eye on this trait as more researchers in the next year determine how much of mite resistance it can explain. BC

A Closer Look

VARROA MITE IPM CONTROL TECHNIQUES

Clarence **Collison**

Successful Varroa Mite Control Solutions Are Proactive

Integrated Pest Management (IPM) is the practice of preventing or suppressing disease and pest populations through the use of multiple control tactics. IPM does not rely on a single tactic to control pests and focuses on management not on control (total eradication). An IPM program is a comprehensive approach to keep pest populations below economic injury levels or action thresholds. An economic injury level is the lowest pest population level that will cause economic damage or the critical population density where the loss caused by the pest equals in monetary value to the cost of management. An economic or action threshold is the point at which management actions should be taken to prevent an increasing pest population from exceeding the economic threshold. Regular monitoring or sampling for the pest is absolutely necessary.

Successful *Varroa* mite control solutions are proactive. They control *Varroa* before the mites reach levels that threaten colony productivity and survival rather than respond after the damage has occurred. An effective *Varroa* IPM program is a set of proactive non-chemical and chemical methods that offers beekeepers the best whole systems approach to controlling *Varroa* (Honey Bee Health Coalition 2018). The pyramid of IPM tactics includes: cultural controls (tactics to reduce drifting, comb culling to reduce number of drone-sized cells, requeening with resistant bee stock, small-sized cells, break in brood cycles); physical/mechanical controls (drone brood removal, screen bottom boards, powdered sugar); biological control (predators/parasites) and chemical controls.

For several years *Varroa* mite (*Varroa destructor* Anderson and Trueman) populations in honey bee colonies were sufficiently controlled using synthetic acaricides. More recently, however, beekeepers have experienced increased resistance by mites to chemical pesticides, which are also known to leave residues in hive products such as wax and honey. For these reasons, many beekeepers have adopted nonchemical Integrated Pest Management (IPM) strategies as alternatives to chemical control tactics (Ellis et al. 2009).

Varroa mites often fall off bees or are groomed off by the bees themselves and fall to the bottom of the hive. These mites will normally re-enter the colony, but if they could be prevented from re-entry it would act to lower the mite population. A simple modification to the hive bottom board was tested as a non-chemical or cultural control method for *Varroa* mites. Wire mesh hardware cloth was used to replace the majority of the surface area of the bottom board underneath the brood area, allowing *Varroa* to fall through and potentially excluding them from re-entering the colony. Thirty colonies received no chemical treatment but were fitted with screen bottom boards, sticky boards or normal bottom boards. Mite fall was monitored in these colonies on a monthly basis and revealed approximately 14% and 28% lower mite fall in the two modified bottom boards compared to the normal bottom board in June and July, respectively. However, by September mite levels in all three sets of colonies had reached damaging levels. Thus the bottom board modification slowed the growth rate of *Varroa* but is not sufficient alone. Additionally, colonies with mesh bottom boards had significantly more sealed brood than colonies on normal bottom boards, an added benefit to using this hive modification. The use of a screen bottom board or screen insert in conjunction with resistant lines of bees, smoke, dusts, or other control agents should provide a more integrated approach to *Varroa* control and could reduce the number of chemical treatments required (Pettis and Shimanuki 1999).

Varroa mites developed resistance to the acaricides fluvalinate and coumaphos which were used extensively for mite control, thus necessitating the need for alternative management methods.

Powdered sugar is most efficacious when it is applied early in the season during a brood-free period.

Dusting bees with powdered sugar has been examined as a remedial control for *Varroa* mites. Two modes of action have been proposed: one being that fine dust impedes the locomotion of phoretic mites and induces them to fall off bees (Ramirez 1994), and another being that dust induces a grooming response in bees that similarly dislodges mites (Macedo et al. 2002). When measured as a percentage of phoretic mites dislodged, powdered sugar dusting has achieved experimental knock-down rates ranging from 77% (Aliano and Ellis 2005) to more than 90% (Fakhimzadeh 2001; Macedo et al. 2002), but a persistent problem has been translating these kinds of results into practical field applications.

In Florida, Ellis et al. (2009) determined the efficacy of powdered sugar as a field-level *Varroa* control tactic by comparing mite populations, adult bee populations, and brood area in untreated colonies with those in colonies dusted with 120g powdered sugar per application. They dusted the top bars of brood combs with powdered sugar every two weeks from April until the following February (11 months). They found that dusting colonies with powdered sugar did not significantly affect the adult bee population (treated: 10,061.72 ± 629.42; control: 10,691.00 ± 554.44) or amount of brood (treated: 4,521.91 ± 342.84 cm^2; control: 4,472.55 ± 365.85 cm^2). They also found no significant differences between the total number of mites per colony (treated: 2,112.15 ± 224.62; control: 2,197.80 ± 207.75), number of mites per adult bee (treated: 0.080 ± 0.010; control: 0.097 ± 0.010), or number of mites per capped brood cell (treated: 0.112 ± 0.013; control: 0.106 ± 0.018). Within the limits of this study and at the application rate used, they did not find that dusting colonies with powdered sugar afforded significant *Varroa* control.

Berry et al. (2012) did a field study in Georgia that 1) exploited a brood-free period of the season when all mites are phoretic on adults and vulnerable to dust treatment (bee colonies in sub-tropical Florida are rarely brood-free); 2) compared more than one dust delivery method, and 3) compared more than one treatment timing interval. They felt that these outstanding questions should be resolved before they abandoned powdered sugar as a bee-safe (Fakhimzadeh 2001) and chemical-free *Varroa* control option. They set up 64 equalized, queen-right colonies (single-body Langstroth hives with screen floors) and divided them equally between two apiary sites in Oconee County, GA. Once in their respective apiaries, each colony was randomly assigned one of eight (2^3) treatment combinations: 1) initiation of powdered sugar treatment (a) in January (broodless period) or (b) in March (brood area rapidly expanding); 2) treatment applied at an interval of (a) every other month for a duration of nine days (four treatments three days apart) or (b) treatment applied one day at an interval of every two weeks, and; 3) powder sugar applied as (a) a dusting of 120 g powdered sugar with a sifter over the top bars of brood combs then brushing the sugar down between frames using a bee brush or (b) powdered sugar (same quantity) blown into the hive entrance with forced air from a shop vacuum cleaner custom-fitted with a chamber made of polyvinyl chloride (PVC) plumbing components holding the powdered sugar. There were eight colonies (replicates) per treatment combination. The treatment interval ran from January to October, inclusive.

Screen hive floors tended to reduce colony mite levels (24-hour sticky sheet counts), sometimes significantly.

They only found that powdered sugar treatments resulted in lower colony *Varroa* mite levels in 25% of their statistical analyses. Their results suggest that powdered sugar is most efficacious when it is applied early in the season during a brood-free period. Colony bee population in May was significantly higher in colonies in which powdered sugar had been blown into hive entrances compared to colonies which had received powdered sugar by sifting it onto exposed brood comb top bars. This suggests that applying powdered sugar with forced air at the hive entrance was less disruptive to bee populations than exposing and dusting comb top bars. Overall, however, they concluded that these results are not a strong affirmation of powdered sugar in the fight against *Varroa*. The technique was ineffective at reducing *Varroa* in 75% of their analyses. Moreover, 10-month colony survival between treated and non-treated colonies was virtually identical, and poor, at 38-39%. Powdered sugar is thus, at best, another "weak" IPM component that may contribute toward *Varroa* management when used in conjunction with other components (Berry et al. 2012).

Two independent, long-term (17 months and 87 weeks) studies were done to appraise the effects of published integrated pest management (IPM) practices on colony *Varroa* mite levels, length of time before onset of treatment threshold, and other measures of colony productivity (Delaplane et al. 2005). Four treatments were tested: 1)queen selected for hygienic behavior (SMR), conventional solid hive floor, 2)hygienic queen, screened floor, 3)non-selected queen, solid floor, and 4)non-selected queen, screen floor. Screen hive floors tended to reduce colony mite levels (24-hour sticky sheet counts), sometimes significantly. Likewise, mite-resistant queens tended to cause a numeric and sometimes significant reduction in mite levels, number of mites on sticky sheets decreased as the percentage expression of hygienic behavior in a colony increased, and on the majority of sampling episodes the number of mites retrieved on sticky sheets was numerically lower in colonies with queens expressing suppressed mite reproduction (SMR). In six of eight cases when IPM components were found to interact they did so in a manner favorable to mite control. Time until achieving treatment threshold was significantly delayed in colonies with SMR queens (c. 72 weeks) compared to non-selected queens (59 weeks). In one experiment, stored honey was significantly reduced in colonies with screens (3.8 frames) compared to solid floors (5.1); likewise, stored pollen was lower in screen colonies

(0.9 frames) than on solid floors (1.3). SMR queens tended to have reduced brood production.

Four combinations of strategies to reduce population growth of *Varroa* mites were tested in honey bee colonies located at two apiary sites. The strategies were combinations of mite tolerant queen stock, screen inserts, and T-02® (active ingredient thymol). The effectiveness of the treatment combinations differed between the apiary sites. Site one apiary was in a cleared forest surrounded by secondary growth, while Site two was on the top of a hill, exposed to the wind. At Site two all but one colony survived the Winter, while at Site one, overwinter mortality of colonies was lowest in those colonies that combined hygienic queens and screen inserts. Mite populations at the end of the study did not differ among treatments or between sites. However, colony populations at Site two were significantly larger and overall colony survival was greater than at Site one. The study demonstrates how the effectiveness of strategies to reduce the impact of *Varroa* on colony survival might ultimately depend upon the location of an apiary and how this affects the growth of colony populations (Sammataro et al. 2004).

Guaranteeing high acaricide efficacy to control *Varroa* mites is fundamental for colony survival. Giacomelli et al. (2016) verified the efficacy and impact of a commercial thymol-based veterinary product (Apiguard®) on colony honey bee populations when used alone or combined with the biotechnical method of caging honey bee queens for 20 days to create an artificial brood interruption period in the colony. Apiguard® killed 76.1% of the mites while queen caging killed 40.6% of the mites. The combination of Apiguard® administration with queen caging killed 96.8% of the mites. Comparing bee numbers before and after treatment, Apiguard® treated colonies with caged queens had 48.7% fewer bees compared to before treatment, while Apiguard® alone reduced the number of adult bees by 13.6%. None of the treatments in the different groups resulted in elevated queen mortality.

The efficacy of drone brood removal for the management of *Varroa* mites in honey bee colonies was evaluated. Colonies were treated with CheckMite+ (coumaphos) in the Fall of 2002. The following spring, quantities of bees and brood were equalized, but colonies were not retreated. The brood nest of each colony consisted of 18 full-depth worker combs and two full-depth drone combs. Each worker comb had <12.9 cm^2 of drone cells. Standard management practices were used throughout the season. Colonies were randomly assigned to one of two groups. In the control group, drone combs remained in place throughout the season. In the treatment group, drone combs were removed on 16 June, 16 July, 16 August, and 16 September and replaced with empty drone combs (16 June) or with drone combs removed on the previous replacement date. In the early Fall, the average mite-to-bee ratio in the control group was significantly greater than the corresponding ratio in the treatment group. Drone brood removal did not adversely affect colony health as measured by the size of the worker population or by honey production. Fall worker populations were similar in the two groups. Honey production in treatment colonies was greater than or similar to production in control colonies. These data demonstrate that drone brood removal can serve as a valuable component in an integrated pest management program for *Varroa* mites and may reduce the need for other treatments on a colony-by-colony basis (Calderone 2005).

Guranteeing high acaricide efficacy to control Varroa mites is fundamental for colony survival.

Drone brood removal did not adversely affect colony health as measured by the size of the worker population or by honey production.

Because mites preferentially reproduce in drone brood, Wantuch and Tarpy (2009) developed a treatment strategy focusing on salvaging parasitized drones while removing mites from them. They removed drone brood from colonies in which there was no acaricidal application and banked them in separate "drone-brood receiving" colonies treated with pesticides to kill mites emerging with drones. They tested 20 colonies divided into three groups: 1)negative control (no mite treatment), 2)positive control (treatment with acaricides), and 3)drone-brood removal and placement into drone-brood receiving colonies. They found that drone-brood trapping significantly lowered mite numbers during the early months of the season, eliminating the need for additional control measures in the Spring. However, mite levels in the drone-brood removal group increased later in the Summer, suggesting that this benefit does not persist throughout the entire season. Their results suggest that this method of drone-brood trapping can be used as an element of an integrated control strategy to control *Varroa* mites, eliminating a large portion of the *Varroa* population with limited chemical treatments while retaining the benefits of maintaining adult drones in the population.

Varroa mites developed resistance to the acaricides fluvalinate and coumaphos which were used extensively for mite control, thus necessitating the need for alternative management methods. Studies have shown that botanical oils, especially thymol, can be effective although results are highly variable. Non-chemical control methods also have some effect on *Varroa* populations when used alone, but the efficacy of these methods when used in combination have not been examined. Rice et al. (2004) experimented with the single-chemical control systems of 1)~~Apistan in the Spring and Fall and 2)thymol-in~~fused florist block in the Spring and Fall and compared them with a mixed IPM (MIPM) system of 3)thymol in the Spring and Fall, hygienic bees, and modified bottom boards, and two rotational IPM systems (RIPM) of 4)thymol in the Spring and apistan in the Fall or 5)Apistan in the Spring and thymol in the Fall. Adult bee population, brood area, mite population, honey production, and colony loss over the period of the experiment were measured to determine overall colony health and treatment impact. During the 24 months that the IPM experiment was conducted, there were no large differences in adult bee population, brood

area and honey production between any of the treatments, although by the end of the experiment replicate numbers were too low to allow for statistical analysis. Colony loss was not significant between treatments. BC

References

Aliano, N.P. and M.D. Ellis 2005. *A strategy for using powdered sugar to reduce Varroa populations in honey bee colonies*. J. Apic. Res. 44: 54-57.

Berry, J.A., O. Afik, M.P. Nolan IV and K.S. Delaplane 2012. *Revisiting powdered sugar for* Varroa *control on honey bees* (Apis mellifera *L.*). J. Apic. Res. 51: 367-368.

Calderone, N.W. 2005. *Evaluation of drone brood removal for management of* Varroa destructor *(Acari: Varroidae) in colonies of* Apis mellifera *(Hymenoptera: Apidae) in the northeastern United States*. J. Econ. Entomol. 98: 645-650.

Delaplane, K.S., J.A. Berry, J.A. Skinner, J.P. Parkman and W.M. Hood 2005. *Integrated pest management against* Varroa destructor *reduces colony mite levels and delays treatment thresholds*. J. Apic. Res. 44: 157-162.

Ellis, A.M, G.W. Hayes and J.D. Ellis 2009. *The efficacy of dusting honey bee colonies with powdered sugar to reduce varroa mite populations*. J. Apic. Res. 48: 72-76.

Fakhimzadeh, K. 2001. *The effects of powdered sugar* Varroa *control on* Apis mellifera *colony development*. J. Apic. Res. 40: 105-109.

Giacomelli, A., M. Pietropaoli, A. Carvelli, F. Iacoponi and G. Formato 2016. *Combination of thymol treatment (Apiguard®) and caging the queen technique to fight* Varroa destructor. Apidologie 47: 606-616.

Honey Bee Health Coalition 2018. *Tools for* Varroa *Management*. The Keystone Policy Center, Pg. 1-29.

Macedo, P.A., J. Wu and M.D. Ellis 2002. *Using inert dusts to detect and assess* Varroa *infestations in honey bee colonies*. J. Apic. Res. 41: 3-7.

Pettis, J.S. and H. Shimanuki 1999. *A hive modification to reduce* Varroa *populations*. Am. Bee J. 139: 471-473.

Ramirez, B.W. 1994. *Conformation of the ambulacrum of* Varroa jacobsoni *Oud. and mite control with dusts*. Am. Bee J. 134: 835.

Rice, N.D., M.L. Winston and H.A. Higo 2004. *Integrated pest management for the parasitic mite* Varroa destructor *(Anderson and Trueman) in colonies of honey bees* (Apis mellifera). Am. Bee J. 144(10): 791-795.

Sammataro, D., G.D. Hoffman, G. Wardell, J. Finley and N. Ostiguy 2004. *Testing a combination of control tactics to manage* Varroa destructor *(Acari: Varroidae) population levels in honey bee (Hymenoptera: Apidae) colonies*. Int. J. Acarol. 30: 71-76.

Wantuch, H.A. and D.R. Tarpy 2009. *Removal of drone brood from* Apis mellifera *(Hymenoptera: Apidae) colonies to control* Varroa destructor *(Acari: Varroidae) and retain adult drones*. J. Econ. Entomol. 102: 2033-2040.

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EYESONHIVES

More Technology In Action

Kelton **Temby,** Joseph **Cazier,** Andrew **Scott**

In this latest article in our *Technology in Action* series, we profile *Eyesonhives* developed by Keltronix, Inc as a tool for beekeepers to remotely view and quantify beehive activity, growth, and health over time.

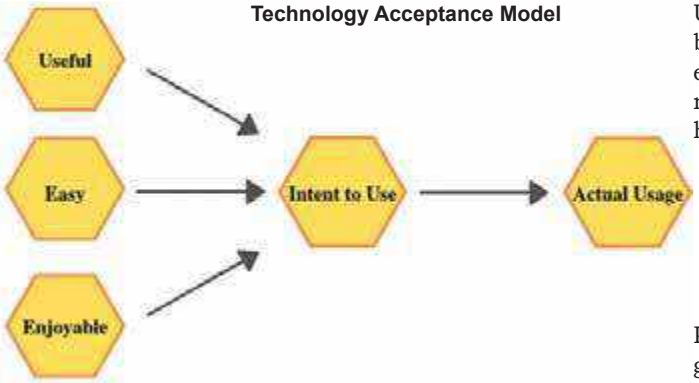
As mentioned in the opening quote, watching bees fly in our and of the hive can be a real joy for beekeepers while providing real insight to what is happening in the hive. Doing this remotely can expand and multiply that joy by better managing the time and location dimensions of that experience. Knowing it is being done well, with key information being extracted by an intelligent agent that never stops working to keep your hives safe, is even better.

In this article, we have the pleasure of reviewing an innovative and exciting technology that brings home the hive experience to all beekeepers, even when they are away from their hives.

As in previous articles in this series, we will continue using the framework of the *Technology Acceptance Model* (TAM) to explore new technologies that may be useful to beekeepers. Recall that TAM posits that the main factors influencing the adoption of a new technology are:

- *Usefulness:* the degree to which the software system provides real value to beekeepers.
- *Ease of Use:* how easy it is to use the technology in the bee yard.
- *Enjoyment*: how enjoyable or meaningful it is to use the technology.

Technology Acceptance Model



Know the Innovators, Understand the Technology

A small group of engineers and beekeepers with backgrounds in healthcare technology, web apps, and robotics founded Keltronix, Inc with the mission of accelerating the transition to sustainable agriculture.

In their own words, here is what they are doing, why they are doing it, and why it is needed:

- *What we're doing:* "with Eyesonhives, we're building an analytics platform based on video and bee flight activity data for beekeepers to monitor and improve honey bee hive health."
- *Why we're doing it:* "we believe beekeeping, like organic farming, supports the health of the environment and is key to sustainable agriculture. Our mission is to accelerate the transition to sustainable agriculture."
- *Why it needs to be done*: "a third of the food we eat depends on bees. Forty percent of bee colonies in the U.S. died out last year, and beekeepers are not getting early warnings. The bees need help and we want to help beekeepers deliver it."

Kelton Temby, Nicholas Cunningham PhD, Scott Ross and Jonathan Simpson

Namesake founder Kelton shares "My grandfather and father were both beekeepers, but my bee journey really began when my friend Jon and I rescued a swarm of bees from my garage wall and gave them a home. I'd sit in front of the hive with my cup of coffee, watching the hive entrance every morning before work, and have been watching, listening, and learning from the bees ever since."

"As I learned more about the state of beekeeping, I was shocked to hear that over and over local commercial beekeepers were finding dead hives – that were booming at their last inspection just a few weeks previous. I had to understand 'what happened in that in-between time.' With Jon's expertise and my medical device and software background, I thought it would be worthwhile to measure the hive's vitals more directly than weight or temperature would allow, ideally without laborious effort or invading the bees' space."

"Count the number of bees flying out of the hive for a minute, and let me know," my friend Paul[1], a beekeeper of 40+ years, asked. He wanted to get a general idea of the health of one of his hives. A metric! Soon after, we

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[1]Paul Cronshaw is a renowned educator, bee enthusiast, President of the Santa Barbara Beekeepers Association, a great friend to the Eyesonhives team, and sits on the team's advisory board.

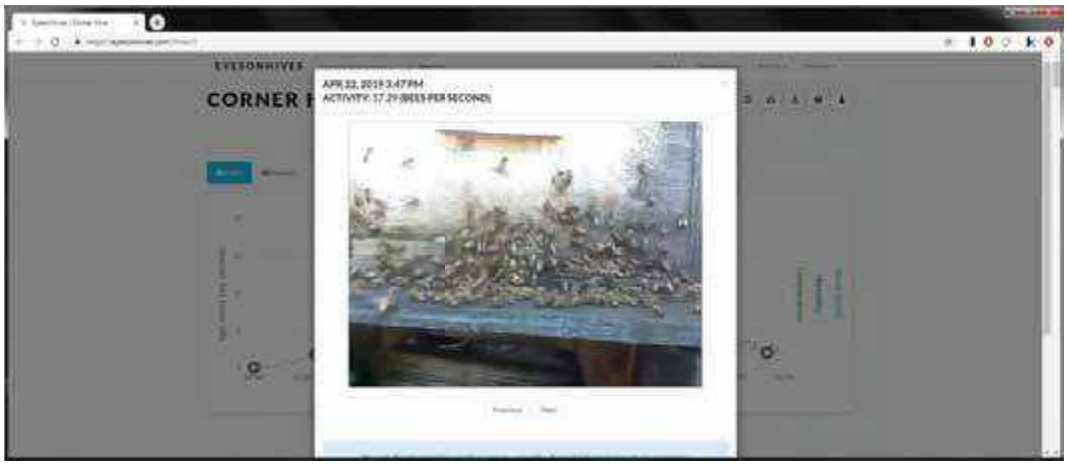


Figure 1. *Eyesonhives Platform with uploaded video.*

were counting bees on three rescue hives and noting the numbers every week. As they grew, the hives became too active to effectively count, and Jon and I committed to designing an algorithm and platform to do this automatically. Eyesonhives was born.

When reading the book, *At the Hive Entrance*, by H. Storch, Kelton began to feel empowered to put his beekeeping desires into action through Eyesonhives. By gaining a first hand account of a citizen scientist recording the complex changing of the seasons and the functions taking place within the hive, many beekeepers have gained a greater sense of wonder and appreciation for the craft.

"The Apiary has grown, and so has our team – having bees inspires us to ask questions about the long-term sustainability of agriculture dependent on bee pollination as well as what it means to be a good steward, urban beekeeper, and neighbor. The mission of the company is to accelerate the transition to sustainable agriculture."

Usefulness

There are a number of features that help with the usefulness of the system. At its most basic level, Eyesonhives helps beekeepers see their bees from anywhere through a highlight reel of bee videos uploaded to the Eyesonhives platform.

Eyesonhives uses edge-network image processing to non-invasively track bee flight activity, and create a data record of the activity from sunrise to sunset, which is remotely viewable and exportable from the Eyesonhives platform, shown in Figures 1, 2, and 3.

For researchers, capturing data automatically eliminates the need for inaccurate and inefficient human estimation of bee flight activity, and makes studying bee activity possible at scale. "We've heard from many researchers that a non-contact sensor which doesn't disturb the bees, but can measure their activity, would be a game changer."

Figure 2. *The Eyesonhives Scout B Device.*

The devices, such as Scout B shown in Figure 2, also process the video to determine the number of flying bees and upload that data, which enables beekeepers to immediately understand what the bees have been up to that day. As more data comes in, that understanding extends out to weeks, months, and years.

Commercial growers' ability to see the bees' activity, health, and productivity enables a shared understanding of the bees' hard work. The bees pollination activity is directly connected with anticipated crop yield; therefore, the bees performance and value can be matched with payment to the beekeeper. For example, see Figure 4 where Eyesonhives monitors bumble bees in a greenhouse.

Eyesonhives helps beekeepers understand bee activity trends and can objectively answer whether a hive is growing or is in decline. This information is particularly relevant when monitoring two hives within the same apiary, since seasonal and weather variations can be factored out, as seen in Figures 5 and 6.

As the Eyesonhives Scout B device measures the number of flying bees in front of the hive "bees per second," or 'bee flux' using the team's patented image processing algorithm, the data captures the hives' behavior in a significantly different way than a traditional IR entrance gate counter. Most surprising is that variations in the daily activity have now led to an understanding of signature activity patterns related directly to the hive's overall health and state.

These signature patterns include new-bee orientation (new bees are related to queen health) as well as swarming and robbing behaviors. For example, Figure 7 shows the "Heartbeat of a Hive" as Kelton shared in a TEDx talk located here: **https://www.youtube.com/watch?v=wOTwtu83pWs**).

It turns out that this spike in the hive superorganism, previously unknown, is a very useful indicator of overall hive health (see Figure 7). Similar signals can indicate when a hive is about to swarm (see Figure 8 and 9), be robbed, or become distressed. Email alerts based on activity thresholds are sent to beekeepers in near real-time today.

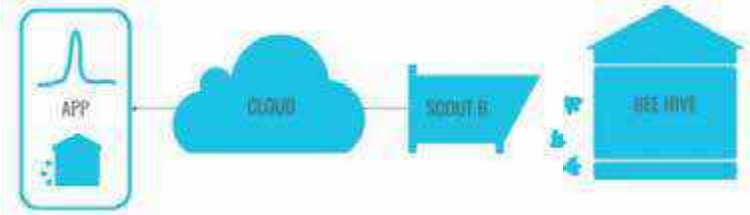


Figure 3. *Collection and storage of Scout B data, easy playback, and visualization via the Eyesonhives app.*

Fortunately, you do not have to watch hours of hive video to see what is going on. Eyesonhives' algorithms watch the data and parse it for you into meaningful graphic signals. However, since there is video behind the data, it's easy for beekeepers to check and literally see what's going on for themselves too.

For researchers, this technology provides a very useful service making bee monitoring and counting, currently done by armies of bored graduate students, easier to do, more scalable, and reliable as the accuracy and known variances unfold.

Easy to Use

Using Eyesonhives is easy. The devices are simply positioned in front of the beehive, connected to WiFi or a cellphone, and powered via USB or the Eyesonhives solar kit as shown in Figure 10.

The videos and data are viewable from the Eyesonhives platform website either on a mobile device when standing in line at the grocery store or on a laptop for a more immersive experience.

There's no frustration to overcome in the field, since the device sits outside the hive altogether and doesn't get in the way during inspections. Most of the image processing is also done in the camera, conserving bandwidth for essential data and allowing for an up to two week run time without an internet connection, if needed.

Enjoyment

We're talking about bee videos here, and all the strange and fascinating goings-on at the hive. Most people who keep bees, especially hobbyist beekeepers, receive a great deal of satisfaction from caring for them, much like they might for a pet. This technology deepens and extends that process by giving beekeepers 24-7 access to their hives, and enriching the enjoyment that goes with it.

Another source of enjoyment can come from the social aspect of sharing information about the hives with other beekeepers, perhaps in your club or association. Every beekeeper on the platform is able to 'follow' other beehives of interest and interact with other beekeepers.

Figure 4. *Eyesonhives monitoring a bumble hive in a greenhouse.*

This technology, and the data from it, have the potential to contribute to this idea and the development of the genius hive (see our original article in the April 2018 Issue of *Bee Culture*). While the data is not currently going to a central repository and being pooled with data from other sources, it may happen at some future date. Even now some of the knowledge and tools are being shared with the community, providing a valuable piece of the puzzle to some of the key problems bees face.

There's also a much bigger picture at play: every hive on the Eyesonhives platform contributes toward the greater goal of understanding bee health. The Eyesonhives platform has machine learning algorithms and AI heuristics, which help classify the known activity patterns, and look for new ones, as more data is added with every additional hive. Researchers around the world are now also using Eyesonhives to understand nut (e.g. Almond) yield correlation to bee activity and see whether a more sustainable application of pesticides could be achieved.

Users, hobbyists, commercial keepers, and researchers alike, can directly contribute to the development of the tools, and ultimately the genius hive, by purchasing the devices, agreeing to share videos, and especially engaging in citizen science activities by tagging hive events with comments to aid the machine learning algorithms.

Additionally, beekeepers can volunteer their time to watch and tag other shared videos donated by other beekeepers. With this helpful data, which can improve the experience for everyone. Together, these activities speed up the development, ease of use and usefulness of the tools and include the enjoyment from giving back to the larger community.

Next we turn to the voice of the customer section, where we listen to those who have been using this technology for some time now and see what we can learn from them.

Voice of the Customer

So what do existing users have to say about Eyesonhives? We reached out to some active users and here's what they had to say:

"Eyesonhives is helping to bring my beekeeping into the 21st Century's information age. Using the EOH system as an extra eye to capture visual cues and other data, I can remotely perform frequent external inspections to effectively and efficiently manage a beehive, and learn more about the fascinating world of the honey bee.

The Eyesonhives system saves me time traveling to an outlying apiary for an inspection. Other benefits include monitoring the hive for pests (eg. ants), learning more about orientation flights, swarming behavior, and weather near the hive (wind and temperature). I have enjoyed watching other wildlife, like spiders and birds, interact with the bees. Showing the video clips to other people makes for great conversations about the importance of the honey bee."

– Paul Cronshaw, President,
Santa Barbara Beekeepers Association

"Monitoring honey bee health for research purposes

Figure 5. *The Eyesonhives Platform showing activity data and video uploaded from the beehive.*

Figure 6. *The Activity Averages of a beehive. It gives an indication of deteriorating colony health, which gives the beekeeper an opportunity to intervene.*

is challenging! The Eyesonhives technology has made it possible for us to follow a cohort of hives and gather really detailed information on the comings and goings of foraging honey bees throughout the days, weeks, and seasons. This has actually been really useful for research as we can get clues on how bee activity is affected even a little from factors like climate, drought, diseases, pests, and chemical pesticides used on crops.

This technology is helping us to understand how to boost activity when really needed, such as during Spring pollination events and how to protect our bees better from stress. Aside from that, the platform is easy to use and the footage is fun to watch! The team at Keltronix have been great to work with, always prompt to respond, and keen to help us accomplish what we hope to!"

Dr. Aimee C. McKinnon, Post-Doctoral Research Officer
Department of Ecology, Environment & Evolution.
La Trobe University. Melbourne, Australia.

Next we share how you too can engage with this technology.

How to get Eyesonhives and get started: Call to Action for Citizen Scientists and Researchers

The simplest way to get started is to buy a device online through the company website at **keltronixinc.**

Figure 7. *The distinctive 'Orientation Spike' discovered by the Eyesonhives team referred to as 'the heartbeat of a beehive.' (Look for the TEDx talk for details.)*

Figure 8. *The 'Swarming Signal.' It is distinctive in that it is much larger in magnitude and generally occurs in the morning, when compared to orientation activity spikes.*

com. The Scout B retails for $300, and the analytics plan is $10/month for the first two devices. There's also a discount bundle for the **Eyesonhives Scout B and first year of the Eyesonhives Platform subscription for $380**. The Eyesonhives team builds devices to order in Nicholas' workshop in Oregon, and works with each customer to pre-configure the system so when the box is opened it can just be plugged right in. Eyesonhives also makes a great gift!

The Eyesonhives team is actively looking to collaborate with researchers interested in enhanced visibility and data for both bumble bee and honey bee monitoring. If you have a grant where private data may be necessary or any other custom requirements are needed, send an inquiry directly to the team at **info@keltronixinc.com** or via the website contact form **https://www.keltronixinc.com/contact/**, the team is happy to offer feedback, support, and quotes for custom projects.

Conclusion

Applying state-of-the-art image processing normally used for robotic vision, the Eyesonhives team has developed a system to remotely and continuously monitor bee colonies, alerting and allowing beekeepers to identify and correct problems and better understand what is happening with their bees.

Eyesonhives is like counting bees by hand, 300 times per day, every single day, and receiving a convenient summary report and highlight reel of videos. With the signature patterns corresponding to important changes in the beehive, the Eyesonhives team has achieved important steps towards a true health monitor for honey bees.

Using data and computer vision is wildly different to how we check bee health today. Traditionally, beekeepers check bee health by opening their hives on a schedule every few weeks. By using technology, we can monitor the hive's activity vitals daily, without doing the open hive surgery of an inspection. We are then only opening up the bees' home when we have a good reason, disturbing the bees less, leaving them be.

Additionally, this technology is an important and necessary step on the path to building a genius hive. Hats off to Kelton and his team for the great work they have done so far and to wishing them good success in the future!

You can find their website at **https://www.keltronixinc.com/** and **https://info.eyesonhives.com**.

Finally, special thanks to *Project Apis m.* for supporting a portion of this work with a *Healthy Hives 2020* grant, to leaders of Eyesonhives and HiveTracks.com for sharing their thoughts on this topic, and to the editors of *Bee Culture* for publishing this work. These efforts would not have been possible without visionary groups like these providing support and resources. BC

Figure 9. *Clustering on the beehive. It is an easy way to confirm a suspected swarming signal. (See the timelapse of this video on the Eyesonhives youtube channel: www.youtube.com/watch?v=5XedY0M414s)*

Figure 10. *Eyesonhives set up in a remote apiary.*

In Pursuit Of The Best Bees

Melanie **Kirby**

Endurance and Adaptation Work In Many Ways

If you had told me back in 1997 that I would wind up being a professional beekeeper and queen breeder, I would've laughed myself to the great beyond. And even funnier, if you would have told me that I would spend 20 years keeping bees before I would return to academia to pursue a graduate degree and travel around the world to visit and interview bee breeders, I would've called you delusional.

But here it is 22 years later, and I'm doing these very things and loving every minute of the wonder, the worry, the mystery, the misery, the exaltation, exhilaration and the eczema of apiculture. The "eczema?," you are asking. Yes, the fact that once you start keeping bees, it has a way of getting under your skin and the itch to go on the beekeeping journey is what propels you to set on the path less followed, yet needed.

For me, this itch to learn more about queens and their drones began to surface when I worked in Hawaii from 2000 to 2005. I worked first for Hawaiian Queen and I credit then owner, Michel Krones, with teaching me how to graft. From what I recall, his beekeeping journey is quite interesting. Having grown up in Argentina of Austrian descent, and then running a honey production outfit in Costa Rica for a couple of decades, then relocating to the Big Island of Hawaii to rear queens, Michel's diverse world travels and experience as an international beekeeper introduced me to just how global beekeeping as an industry is. After working for Michel for a season, I went to work for Gus Rouse, then owner of Kona Queens. I worked for Gus for four years and was able to really "train" like an Olympian queen producer crew member. I treasure the experiences and interactions I was able to cultivate with his international crew. While working at Kona Queen, I worked alongside several Canadian, Chilean, French, Hawaiian, West Coast, Midwestern, East Coast, Scottish, New Zealander, Australian beekeepers, and many more.

These diverse beekeepers introduced me to the idea that advancing one's beekeeping and queen rearing skills could take you around the world. These skills evolve as one becomes exposed and familiar to keeping bees in varied topographies. And how interesting it is that beekeeping is the same, yet different, depending on where you are. And while the plants and nectar flows change, and the weather and tactics are different, the core remains the same: To keep bees healthy and productive.

I truly loved my time spent working for these operations in Hawaii. And lucky for me, I was able to go back in 2017 to visit some of these beekeepers and to interact with another queen production outfit, Big Island Queens, who also demonstrates their belief in the same core mission of keeping bees healthy and productive. But before I jump to the present, I'd like to take you all on a little journey – through time and space, and 'The Race' to find quality stock that endures and adapts.

I should preface this section by drawing attention to the dual concepts of *endurance* and *adaption*. I call attention to these two definitive terms to present that the needs for these, are also dual. Not only do beekeepers need enduring and adaptable stock; but beekeepers must also demonstrate their endurance and adaptability as well. This means that both the beekeeper and their bee stock must be tested time and again and must demonstrate their abilities to keep up.

This is a very daunting task, and one that holds a lot of emotions for beekeepers. I heard Eric Olsen, one

of Washington's largest commercial beekeepers (now retired) say at the 2012 Western Apicultural Society of North America conference held in Seattle, "When my bees are doing good, I'm on top of the world. And when they aren't, I'm miserable." And I echo his sentiments. When my bees are performing well, and the season is presenting positive weather and forage scenarios, I'm on Cloud 9. And when my bees are struggling, bears wipe out 40% of my flock, drought dwindles my bees' honey stores and harvests, I'm feeling myself sinking into the dismal dumps. These opposite-ended emotions are just the extremes. There are also all the other emotions mixed in between that also reaffirm just how connected we are emotionally to our craft. From eureka to bewilderment, from confident to insecure, and from generous to greedy, our bees and their hive performance take us along a roller coaster ride of feelings.

What inevitably happens is that the more seasons we practice this artistic science and scientific art, the more we begin to recognize all the things we still have yet to learn, while at the same time, recognizing all the devilish details that bring to the forefront just how interconnected our bees, our environment, our land stewardship, our research, our policies, our economics, our cultures and our philosophies are. And each of these details carries our emotions as well. With the increasing news of biodiversity loss, shifting climate, bee losses, AND increasing demands and needs, it is becoming ever more apparent, that bees and their keepers, are facing some of the most intense challenges all at the same time.

My introduction to queen rearing came about circumstance. I just happened to be living in Hawaii after finishing my Peace Corps service (which introduced me to beekeeping) and was standing in line at the DMV behind a guy wearing a beekeeping t-shirt. My Peace Corps (PC) friend (whose mother had invited me to help on her gardenia farm after my PC tour in South America), was with me and she nudged me and whispered, "You should introduce yourself and talk to him. Tell him you're a beekeeper, too!" Little did I know that that introduction, would not only introduce me to American commercial queen rearing, but would also invite me down the rabbit hole of queen breeding.

After Hawaii, I worked for Garry Orescovich, owner of Honey Land Farms which was based in Cascade, Wisconsin and migrated to Howie-in-the-Hills, Florida for the winter and early queen rearing season. Garry – a true Midwesterner, is a force to be reckoned with. He was like three guys in the field – moving about swiftly, efficiently and focused. Garry taught me that the importance of breeder selection was only half the equation. The other half revolved around rearing protocol; AND how timing, is crucial to quality. Over the next few years, I would work for Garry seasonally at his Florida operation. I learned how to integrate several services into a well-rounded beekeeping operation including honey production, queen production, package and nucleus production, and how one could become efficient and successful with a migratory operation. Garry had learned how to live in two different regions and demonstrated regally that being a nuanced beekeeper meant allowing oneself to be exposed to different habitats and to developing varied lines of production and services. To this day, he has been the most conscientious beekeeper that I have ever had the honor of declaring to be my most experienced mentor.

It was while working for Garry that I met and partnered with Mark Spitzig of Superior Honey Farms. Mark's one-man-band honey production operation was based in the Upper Peninsula of Michigan- on the shores of Lake Superior. Together, we took his 50 colony mini-operation and doubled it. And then somehow, I was able to convince him to bring half of them to my home state of New Mexico- where the desert and the plains meet the Rocky Mountains. We had anticipated spending half the time in Michigan and the other half in New Mexico; but as topography and weather have it, the southern Rockies exposed our developing survivor stock to hot and dry, riparian, high desert, alpine, sky island and tundra conditions. Mark had started with some hardy New World Carniolan stock known for over-wintering well as well as some Italian cross strains. Little did he know that his basic practice of splitting off of his best hives would lay the foundation for his quest to find resilient and adaptable stock.

Together, we established Zia Queenbees and for the past 14 years, we learned just how hard and how arduous professional beekeeping can be as first generation, landless bee farmers. We have both been able to turn our queen breeding aspirations into a small, yet reputable resource for quality stock. It has taken a lot of blood, sweat and tears to get to this point. It has also taken many a waxing and waning of hive numbers, migrations and management manifestations to maintain the long-lived lines and to continue to share them from north to south, and east to west, through the seasons and stages of life (like the Zia sun symbol) – from the shores of Lake Superior, to the banks of the Rio Grande.

Our stories and cross-country collaborations are distinct, yet not necessarily unique. For there are numerous individuals, collaborations and movements all working as their own; yet also part of a community of keepers creating methods of resilience with emphasis on conscientious selection and mindful propagation. Each of their case studies are enlightening. And all of them together, are a reminder that we are not in this alone. We are not trying to keep our bees as individual cells in a free fall; but rather, we, like our individual bees, can gather into a super-organism to find a queen for all seasons.

So how does one go about creating their queen breeding story and joining the superorganism?

It all starts with a seed . . .

Next Time – Bees As Seeds BC

SAVE LIVES! MONITOR HIVES!

Meghan **Milbrath**

Our goal as beekeepers is to keep our bees safe and healthy, and to make sure that our beekeeping doesn't affect the health of the humans and the environment around us. If we don't monitor, we risk spreading disease to neighboring honey bee colonies or even native bees, or we risk overusing chemical inputs.

The fight against *Varroa* is a battle on two fronts – we are combating the mites within our hives, while at the same time we are struggling to breed bees that can survive this pest. This two-front problem has led to a divide in the beekeeping community – fighters on one line or the other sometimes don't see eye-to-eye. One side values the quest for better bees in the future, and they don't see how we can get there when we treat all the time. The other side values the health of our current animals, and they don't see how we can beat a disease when crashing colonies are adding to the risk.

These values can seem at odds when we approach the issue from one side or the other, and it sometimes feels like we will lose both battles while continuing to fight among ourselves. Don't despair! We have a knight in shining armor – the one weapon that can save us on both fronts, and restore peace to the beekeeping world – Monitoring! I understand that monitoring may not sound like the sexiest solution to a deadly global problem, but it is truly the one tool that we have that helps us keep our own bees alive, reduce the spread of disease, and work towards getting better bees.

A decade ago, before we really understood the value of monitoring, we had two bad options for the varroa problem: don't treat, and hope that some bees survive with valuable traits, or treat all the time and hope that there is an outside solution to this pest. Now that we have monitoring, both of these extreme positions are outdated (Those of you still fighting about this on the internet, you are out of touch – it is time to put down those pitchforks and pick up a monitoring kit!). It is no longer acceptable to let colonies die when we can identify the survivors before colony death – the deaths resulting from the 'live and let die' strategy are unnecessary and promote the epidemic. It is also not necessary to simply use chemical treatments all the time, which can lead to health risks and possible resistance. Monitoring allows us to breed better bees by identifying survivor colonies, and it allows us to protect our individual colonies by identifying when treatment is needed. With monitoring, we can value the health of our bees now and the health of bees in the future.

Hands on training is the best way to learn monitoring. Take a friend to the beeyard with you. photo by Andrew Potter.

Monitoring allows us to practice integrated pest management (IPM). IPM is a system of managing pests that was designed to reduce harm to humans and the environment. A good IPM strategy is based on the following principles:

1) Understand the biology and life cycle of your target pest,
2) Monitor to make sure that the pest doesn't reach damaging thresholds,
3) Use a variety of non-chemical tools first (biological, cultural, physical),
4) Use chemical tools when the pest will cause damage.

Obviously, we can use monitoring for IPM step 2, making sure that the *Varroa* mites haven't reached dangerous levels. However, we can also use monitoring for step one, understanding the life cycle of this pest. When we monitor year after year (and take good notes), we can start to understand the natural *Varroa* dynamics in our area. For example, in Southern Michigan, where I live, I have seen the same cycle over the last few years – I don't see any mites in June, just a few in July, and they start to peak in mid-August. I know that I have to practice some sort of control before mid-August in order to keep by bees from this dangerous peak. This can change of course, but I have a good understanding of the *Varroa* population dynamics in my area, which can drive my management plan, and help me develop a strategy where the mites never reach dangerous levels.

Even if you have never monitored, you likely have some data on mite population dynamics in your area – if you lose over 30% of your colonies every year, you likely are having a dangerous peak in parasite

load when your Winter bees are getting made. You have enough data to tell you that you will need to take action earlier in the season to protect your bees.

How to monitor

If we want to use monitoring for step 2 of IPM (making sure that mites don't reach damaging thresholds), we need to use a type of monitoring that provides us with a number we can match against a threshold. For *Varroa*, the number we want is the *proportion of mites per bees, or percent infestation.* This means that we need a known number of bees, and we need to see how many mites we have. We can do this with a version of the sugar roll/alcohol wash/ether roll. Other methods may allow us to see mites, but they don't provide us with a clear, actionable number. For example, if we just uncap drone brood and don't see mites, we don't know we are safe. Likewise, it is really difficult to interpret the numbers we get off a sticky board, because it depends so much on the size of the cluster. We want a result that can be compared from hive to hive, within a hive over time, and against a known threshold.

To get a result in terms of percent infestation, take ½ cup of adult worker bees (about 300) from a frame in the brood nest, and add them to a jar with a screened top. You will use powdered sugar or alcohol (or another substance – sometimes people use windshield wiper fluid or ether) to knock the mites off. The mites are shaken through the screen into a container where they can be counted. If you divide the number of mites by three (to account for the 300 bees in the sample), you will get percent infestation. For step by step instructions, and instructional videos, and info on pre-made kits visit **www.keepbeesalive.org**. The substance that you use to remove mites will determine how many you recover from your sample. Usually, you can get the most mites off when you use an alcohol wash. The downside to an alcohol wash is that it also kills the sample of bees (still way better than losing your whole colony, but it is hard for those of us with big soft hearts). You can use a sugar roll or CO_2 to knock mites off if you can't handle the alcohol wash, but just keep in mind that you will likely get fewer mites (you can underestimate). Usually, this underestimation isn't enough to change what you need to do for management, but it is important to take into account.

Here's the trick. Once the bees are washed and mites counted wash them again. More mites? No mites? Both results tell you something. The first, you didn't shake the sample long enough and/or hard enough. Learn from that.

The second – you *probably* did. Every time. *Every.* Double test to make sure ***YOU*** are not the problem.

How many mites are too many mites?

The Honey Bee Health Coalition has a good table of treatment thresholds in their "Tools for *Varroa* Management Guide" available at **https://honeybeehealthcoalition.org/varroa/**.

In the table, you'll note that the safe threshold varies over time, depending on the brood in your hive.

Table 1: Treatment thresholds recommended by the Honey Bee Health Coalition, where % = number of mites/100 adult bees. Acceptable = current mite populations are not an immediate threat. Danger = Colony loss is likely unless the beekeeper controls *Varroa* immediately.

This table is a good place to start, but keep in mind that your risk can change from year to year, and you may have to adjust. Make sure to always check the published dates when you look at threshold recommendations. *Varroa*-virus dynamics have changed in the U.S., and older numbers are no longer safe or relevant. If you use threshold recommendations from even five years ago, you will be in trouble.

Table 1: Treatment Thresholds by Phase:(% = Number of mites/100 adult bees)

Colony Phase	Acceptable Further control not needed	Danger Control promptly
Dormant with brood	<1%	>2%
Dormant without brood	<1%	>3%
Population Increase	<1%	>2-3%
Peak Population	<2%	>3%
Population Decrease	<2%	>2-3%

Acceptable: *Current mite populations are not an immediate threat.*

Caution: *Mite population is reaching levels that may soon cause damage; non-chemical control might be employed while chemical control may be needed within a month; continue to sample and be prepared to intervene.*

Danger: *Colony loss is likely unless the beekeeper controls Varroa immediately.*

When to monitor

It is good practice to start monitoring early in the season, even though varroa risk is usually low at this time. First, it will give you the full picture of *Varroa* growth and dynamics – you will be able to follow the population over time, and get an understanding of the risk in your area. Secondly, starting early will give you good practice, so that when risk is high, you can trust your data. There is a bit of a learning curve with monitoring – especially with making sure that you get a full scoop of bees. You want to be good at monitoring before the risk gets high, so that if you see a low number, you know your bees are safe (and you aren't worried that it is because you messed up). A standard recommendation by extension is to monitor once a month through the season, and a little more when risk is high. For example, in my area I would monitor in May, June, July, beginning of August, mid-August, beginning of September, mid-September, and beginning of October.

There are tools that can help you monitor. You can make the kits yourself out of cheap and easy materials (Sugar roll kit instructions: **https://beeinformed.org/2013/03/19/how-to-make-a-sugar-roll-jar/**, or an alcohol wash kit instructions: **http://scientificbeekeeping.com/an-improved-but-not-yet-perfect-varroa-mite-washer/**). However, there are a lot of us who sometimes mix up "can" with "will." We all *can* go out and buy hardware cloth and cut it, but *will* we? Sometimes it is easier to purchase kits, and you can find them for sugar rolls or alcohol washes.

There is even a phone app 'MiteCheck' (for android and Ios) that will walk you through each step to make sure you don't forget anything when you are in the field. The MiteCheck program also has a citizen science program, where you can report your mite numbers – helping scientists understand dynamics across the country. You can view current mite counts by county to know when levels are becoming high in your area. Find out more at **www.mitecheck.com**.

Pitfalls

Don't fall prey to some of the common monitoring and management mistakes. The biggest mistake that beekeepers make is they are too late. Remember, you want to keep your bees safe. This means that you want to prevent a parasite boom from happening – not just revenge kill the mites after your bees are damaged. Too many beekeepers wait to monitor/manage mites until it is too late, and the bees are already damaged. Make sure you have treatments on hand (or are able to order them immediately), if you know you'll need them. Also make sure to account for the time they take to work – some of treatments need to be in the hive for weeks. You don't want to wait until your colony is totally overwhelmed, take a week to go to the bee supply store, and then apply a treatment that takes four weeks to work. Be proactive, and focus on protecting your bees.

Another common mistake is to assume that once you have treated your bees will be fine. You want to monitor after treatment to ensure that it worked well. You can use a sticky board during treatment to witness mite drop, and you should do a regular check (alcohol wash) after the treatment time has concluded to make sure treatment was sufficient, and that your bees are still safe. It is unfortunately all too common that beekeepers treat in the late Summer, only to have their hives bombarded by the hives crashing around them, and a colony that has low numbers can spike later on. Watch for a resurgence – it is very common in many areas.

Finally, make sure that your information is up to date. Years ago, it was just recommended to treat in the Fall. We now know that fall treatment is too late, and if you aren't watching your local mite populations, you may be coming in after the population spike. There is also bad messaging about first year beekeepers – there is a bad rumor on the internet that first year beekeepers don't need to worry. That may have been true in the 1990s, but it hasn't been the case for years. Finally, make sure that you are getting up to date threshold information. Old threshold numbers still abound on the internet, some of them 10 times higher than what we consider safe now!

Using monitoring to protect your bees and to move towards better bees

The near-term goal with mite management is to never let our colonies become overwhelmed with parasites. The health of our colonies depends on having enough healthy individual bees. If too many bees have injury or viruses from mites feeding on them, the whole colony will suffer and die. With monitoring, we can understand when peaks are likely in our area, and also to know right away if we have any colonies that are in trouble, so we can help them immediately and prevent disease from getting worse and from spreading.

Our long term goal with *Varroa* is to find bees that can survive this pest. Before we had monitoring, the only way to know which colonies could survive a *Varroa* epidemic was to see which ones didn't die. This resulted in lots of unnecessary death, suffering, economic loss, and it contributed to the spread of disease. While I think it is essential that we find bees that than find a balance with *Varroa*, I am happy that I don't have to treat my animals so horribly anymore to do so. When we monitor, we can tell which bees can't handle *Varroa before* they die. If I find a colony where the *Varroa* population is unmanaged by the bees, I step in and treat that colony to save the workers, and will requeen with a queen from a better hive or from a breeding program to manage *Varroa*. I can get the information that I need earlier in the season, and save all of my colonies. That way I'm helping to find *Varroa*-resistant bees, but I'm doing so in a responsible way.

Good monitoring practice is the key to colony health, and to developing better bees.

Monitoring can help us get out of the quagmire of perpetual death and disease, and save us from our own poor practices. We're really struggling to get control of the varroa-virus complex, and we continue to make a lot of mistakes.

- We lose a lot of colonies **every year** because we didn't realize they were in danger.
- Many bees die because the disease isn't managed in time- we treat too late because we don't know our local disease dynamics.
- We have perpetuated the epidemic, making the risk worse for our neighbors, and putting native bee populations at risk.
- We are dependent on chemical treatments in our colonies.
- We are really mean to each other when we talk about *Varroa* management.

Get a kit, and go out and monitor. Take good notes, so you know what your disease risk in your area. Make a plan to control mites before they endanger your bees, using your previous years' data. Monitor through the whole season to make sure you immediately can respond to peaks. Use monitoring to identify the colonies that can handle mites, and use queens from those colonies to requeen your other hives. It is on all of us to keep our bees healthy and get this epidemic under control. BC

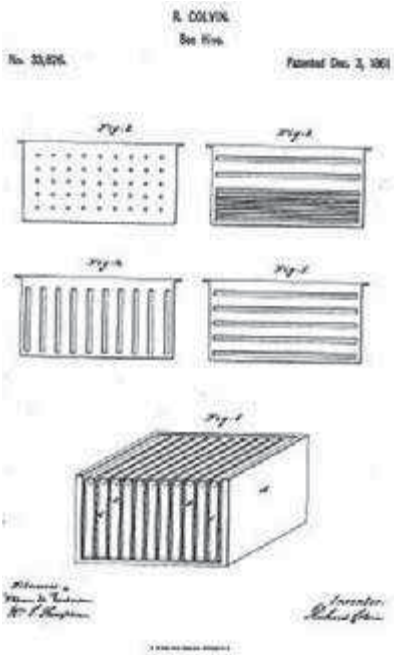
Richard Colvin

Matt **Redman**

Italian Bees, Moveable Frame Hives, L.L.'s Friend – But More!

Pennsylvania Academy of Fine Arts. Bequest of Dr. Paul J. Sartain
Etching, engraving and mezzotint by John Sartain (1808-1897)

When Richard Colvin died in Baltimore City in December 1872, the editor of the American Bee Journal, Rev. W.F. Clarke, nearly omitted mention of his passing. In a letter mailed off in February 1873, but published in March of that year, a concerned reader from Maryland by the name of Daniel Worthington, aware that Rev. Lorenzo L. Langstroth (or LLL, as his name was often initialized) was likely going through a phase of his peculiar "head troubles", humbly composed a place-filler obituary that honorably praised Mr. Colvin's manifold contributions to American beekeeping. The complete state of suffering and anguish of Rev. Langstroth, at this point in time, made the effort to write an obituary for his old friend Richard Colvin nearly unthinkable, as LLL's wife and anchoring amanuensis, Anna Tucker Langstroth, had died in January 1873.



Mr. Worthington effusively submitted that Mr. Colvin ". . . was one of the first men of means who took hold of the movable comb system, and gave his time and money freely to introduce it into the general use . . . from a desire to aid the cause of bee-culture, in which he took so deep an interest . . ." Furthermore, Worthington noted that Mr. Colvin ". . . was among the first importers of the Italian bee." While the late apiarist was not a frequent correspondent of the ABJ, Worthington called attention to ". . . several articles from Mr. Colvin's pen in the first volume . . . and a very valuable paper by him on bee culture . . . which show his thorough familiarity with the subject . . ." Daniel Worthington summed up Richard Colvin's character and value to beekeeping as follows: "His pleasant manner and great kindness of heart endeared him to all who had the good fortune to know him, and his early death . . . leaves a vacancy in the list of apiarians which cannot easily be filled."

There would have been little disagreement with Mr. Worthington's assessment of Colvin's prowess among the beekeeping community nationwide. When H.B. Weiss wrote The Pioneer Century of American Entomology in 1936 he included Richard Colvin among the individuals covered. On the list of agents for the American Bee Journal in 1861, Richard Colvin's name garnered the top spot. He could hold his own with the beekeepers on that list, which included heavyweight colleagues like Samuel Wagner of York, PA and Rev. L.L.

Langstroth of Oxford, OH. No less than his friends, Colvin was a writer, inventor, speculator, competitor, educator, and booster.

In the same consistent manner as LLL, Colvin was keen and thorough in his reportage. In a short piece called "Development of Queen Bees" in issue No. 9 of the first volume of the *ABJ*, he backed up his friend Rev. Langstroth's previous observation of the "slow development" of a queen bee, acknowledging that "... similar cases have come under my notice." At a time when Italian bees were still a novelty, Colvin wrote:

"On the 24th of June last, I removed an Italian queen from her hive. Some 10 or 12 queen cells were built. On

the 3rd of July (just ten days after the removal of the old queen), on examining, I found two or three young queens had already emerged from their cells, and the workers were busily engaged in tearing open most of the remaining royal cells."

Colvin cited another similar example and concluded that "the eggs from which the developed queens were reared, must have been laid six days prior to the removal of the queen . . ." He dismissed the possibility that "the bees . . . developed them in less than their usual period of sixteen days." Writing in the November 1878 issue of *Gleanings in Bee Culture*, Langstroth credited his friend with the following trick: "The late Mr. Richard Colvin showed me a method of inducing bees to build queen cells in convenient places, by enlarging with a round stick any cell building a suitable larva."

Richard Colvin was a man of wealth and, among other pursuits, used his fortune to promote the moveable frame hive as patented in 1852 by Langstroth. In 1859, Langstroth and Colvin together compiled a book that borrowed almost exclusively from Langstroth's earlier work. Printed by Forrest and Bringman in Baltimore, it had the following lengthy title: A small treatise containing some important facts with a few practical directions for managing the bee and hive, compiled by permission from Langstroth on the honey bee. The business relationship between Colvin and Langstroth seems to have been mutually beneficial. Colvin invented an artificial comb guide ". . . to compel the bees to build straight combs." Comb guides were useful in the days before foundation. Colvin advertised his comb guides along with sales literature for Langstroth hives. A favorable promotional statement ends an unsigned article on Colvin's guide in the April 1861 issue of the ABJ: "Beekeepers using the Langstroth hive, and living in territory belonging to Mr. Colvin, or Mr. Langstroth, have the privilege of using these guides free of charge."

Not long after the introduction of the Colvin Comb Guide, LLL came up with his own improvements and simplifications, "retaining Mr. Colvin's original principle, but adding to it two very important features, viz: that these guide frames regulate the distance between the comb-frames, and hold them firmly together and 'out of wind'." Langstroth duly noted in the Vol. 1, No. 9 issue of the ABJ that if Colvin obtained a patent for his guide invention then LLL's tweaked version could, nonetheless, only be used with Colvin's permission. Langstroth speculated that ". . . if the final result justifies our expectations, the Improved Colvin Guide Frames will be second in importance only to the movable comb principle." Though, of course, the introduction of wax foundation from the roller presses of Amos Root, by 1875, swiftly did away with the need for comb guides, Richard Colvin duly obtained U.S. Patent No. 33826 in December 1861, titled IMPROVEMENT IN BEEHIVES, laying claim to the following invention: "The divisions or partitions placed between the spaces designed to be occupied by combs in bee-hives for the purpose of insuring straight and uniform combs . . . when either the partitions or comb-frames or both, are made capable of independent lateral movement."

Interesting testimonials began to appear wherein the merits of Langstroth and Colvin were compared– like this affirmation by William Dinwiddie in the May 1868 volume of The Southern Planter and Farmer (a periodical published in Richmond, VA):

"In my own apiary, I use the Langstroth hive. I prefer it as improved by Mr. Richard Colvin, of Baltimore. I have a model hive bought of Mr. Langstroth himself, but Mr. Colvin's are far better made, and his improvements I think valuable."

Apparently, Richard Colvin had two major apiaries operating about 525 miles from each other. His residence was at 77 E. Baltimore St., in Baltimore City and his nearby business, conducted on a city lot, was called "Sunny Side Apiary"– established in 1853. Colvin also had a thriving bee enterprise with convenient access to the train depot in White Sulphur, Delaware Co., OH. A beekeeper named "J.C.", in correspondence to The Ohio Cultivator in 1859, gives the following impassioned description:

"At Mr. Colvin's Apiary, I saw a most beautiful sight. There, upon the eastern bank of the Scioto, is established a little city of bees, consisting of about one hundred colonies, in Langstroth's moveable comb hives, furnished them by the proprietor. . . I shall adopt this Langstroth hive, after rejecting all other patent hives that have ever been presented to me heretofore, considering this the hive. It will pay well to call and see Mr. Colvin's Apiary."

Imitation and patent infringement threatened LLL's enterprise but the inventor was able to extend his hive patent for seven years from October 1866. By this time, Richard Colvin held exclusive territorial rights of LLL's patent in the States of Delaware, Maryland, and part of Ohio. The major rival to Langstroth and Colvin's carefully patented enterprise was H.A. King and Co. of Nevada, OH. Moveable frame hive competition was hot and, in the month of May 1867, when Colvin took out an ad in the Delaware (Ohio) Gazette cautioning King for spreading rumors and for patent infringement, King placed this mocking ad just below Colvin's:

"THE AMERICAN MOVEABLE COMB BEE-HIVE gives permanent satisfaction and has taken the first premium at many State fairs, and at the Ohio State fair for the last three years in succession. The great and increasing popularity of the Hive, has caused Mr. COLVIN and others interested in the Langstroth Hive, Patent, to set up the cry of (like some defeated politicians) 'foul play,' 'infringement,' &c. While we admit no claim of infringement on either style of the improved frame, we do admit that several parties have been frightened; but we know of no one, who, after writing to Mr. LANGSTROTH and ourselves, did not at once resume the even tenor of their way, selling hives without feeling any serious effects from their fright." BC

Image Courtesy of Betsy Butler, Columbus, OH

Autumn Crocus

Fall Blooming Plants In The Northeast

Connie **Krochmal**

Nature saves the best for last when it comes to Northeastern bee plants. While some of the species below might begin blooming during late Summer, most continue until a hard freeze. The bee plants featured below are by no means limited to the Northeast.

Some hardy Fall blooming bulbs are suited to the Northeast. **Showy Autumn-crocus** (*Colchicum speciosum)* and **Autumn-crocus** *(Colchicum autumnale)* are hardy to zone four. Mostly rose purple, their blossoms provide nectar and pollen.

Several species of **Fall blooming crocus** are hardy to zone five. These include **Kotschy's crocus** (*Crocus kotschyanus)* with rose-lilac blossoms, **Long flowered crocus** *(Crocus longiflorus*) with purple flowers, and **Showy Fall crocus** (*Crocus speciosum)* featuring white or lavender blooms. Bees visit these blossoms for nectar and pollen.

Goldsturm Black Eyed Susan (*Rudbeckia fulgida var. sullivantii)* is among the longest blooming perennials for the Northeast. If deadheaded once, it can bear blossoms through October. Easy to grow from seed, this plant thrives in most reasonably fertile, well drained soils.

Hardy to zone three, it prefers full sun to partial shade. Black eyed susans are sources of nectar and pollen.

Depending on the planting time, **buckwheat** (*Fagopyrum esculentum)* continues flowering until frost. Successive sowings can be done several weeks apart for a total of three to four sowings. Planting is typically done from the last week of May through July 15.

Generally pest and disease free, this crop adapts to a range of well drained, moist soil types except for heavy ones. It is suitable for poor, infertile soils and acid conditions.

Buckwheat is among the most reliable honey plants in the Northeast and northern U.S. The thick, heavy bodied honey, resembling molasses, can be hard to extract. Slow to granulate, this crystallizes with coarse flaky grains.

This honey is typically so dark it can be almost black. Sometimes, it can also be light to dark brown or reddish. On average, an acre of buckwheat can bring 150 pounds of honey per colony.

Asters are familiar late blooming Northeastern wildflowers. They're excellent nectar and pollen plants, and can bring good honey crops.

Often cultivated, the New England aster (*Aster novae-*

Black Eyed Susan

Asters

Goldenrod

Summersweet

angliae) is one of the tallest species, reaching eight feet in height. The much-branched, stout, hairy plant has lance-shaped leaves that clasp the stem. Forming loose, terminal clusters, the striking purple or red blossoms, an inch wide, have yellow or orange centers.

These open from August through October. Found throughout the East, this choice plant occurs in damp and moist sites.

When the bees are working the asters, beekeepers will notice a strong, distinctive aroma around the hives. Pure aster honey is premium quality. It is water white or light amber to very dark.

The flavor varies from delicate to quite spicy, and is reminiscent of herbs. All but that from the heart-shaped aster usually granulates rather rapidly.

Goldenrods are very common in the Northeast. The tough, adaptable plants are found in an array of habitats. Frequently, these grow in meadows, old fields, open woods, thickets, waste ground, and along roadsides.

The rough-leaved goldenrod (*Solidago rugosa)* is an important honey plant in the Northeast. Adapted to both dry and wet situations, it favors borders of woods, low ground, open areas, stream banks, and swampy or boggy places.

This species has a solitary, very leafy stem, 1½ to 6½ feet tall. The foliage and stems are extremely hairy. Crowded together, the rough, wrinkled, toothed leaves are oval to lance-shaped. From August through October, blossoms form wide-spreading panicles on one-sided, curved plumes.

Goldenrods do well in full sun to partial shade. Of the cultivated goldenrods, Cloth of Gold is an especially good bee plant. The dwarf, vigorous plant reaches 1½ to two feet in height.

Once the bees begin working the goldenrod blossoms, the apiary will have a characteristic beer-like aroma. The plants can yield forty pounds of honey per colony. That's in addition to a pound or two of pollen.

Very popular among bakers, goldenrod honey is usually thick and heavy with a full-bodied, strong, spicy flavor. The color varies from light to dark amber or golden yellow. Forming coarse grains, this honey crystallizes within a few months and is ideal for creamed honey. Goldenrod honey can ferment in the combs if a cold snap arrives before the crop is completely ripened.

Some of the late blooming shrubs and vines for this area include the following. **Summersweet** (*Clethra alnifolia)* is hardy to zone four. This native blooms from late July to October.

All of the summersweets can provide a honey crop of about 30 pounds per colony. The excellent quality, light-colored honey has a pleasing flavor. Rarely granulating, it is heavy bodied and combines well with other honeys.

Sweet Autumn clematis (*Clematis ternifolia)* is a naturalized vine that occurs in all of the East and most of the Midwest. Hardy to zone four, it blooms from late Summer into Fall. All clematis can yield honey when enough plants are available.

Cornish or wandering heath (*Erica vagans)* is hardy to zone five. Blossoms appear from September through November. Cornish heath honey isn't as thick or gel-like as that of ling, a related species.

Golden Crown Beard (*Verbesina encelioides)*

While the plants discussed above have been featured in previous articles, the ones below haven't.

Also called butter daisy, this is related to the golden honey plant, which blooms slightly earlier. Golden crown beard is a winged annual that occurs in waste places, pastures, and fields. Originally a western species, it is now found in almost all states with some exceptions.

With winged petioles, the much branched, hairy stems are three feet in height. The lower leaves are opposite, while the upper ones are alternate. Irregularly toothed, the four inch long foliage can be oval, ovate, triangular, or lanceolate. Green to grayish-green and hairy on both surfaces, this is pale green beneath with a white stripe.

Flower heads emerge in panicles on long peduncles from May into October. The blossoms are in solitary, globular heads, two inches across. The disk flowers are yellow, while the numerous rays, which are sometimes toothed, are golden to dark yellow. The blooms feature one to two series of hairy bracts.

The leathery achene is broadly winged and hairy. This can be dark brown to black.

Growing Crown Beard and Related Species

Generally, all of these species can be somewhat weedy looking, which likely explains why they aren't widely cultivated. The golden crown beard as well as the golden

honey plant are sometimes grown mainly due to their bee value. These versatile plants are suitable for challenging sites where most species languish.

They're easy to grow from seed, and can also be propagated by cuttings. Direct sow the seeds 1/8 inch deep in early Spring, usually April or so. Once established, this can self sow.

Golden crown beard is suited to full sun and partial shade. Moist to well drained sites are suitable. These thrive in average garden soils.

The plants require minimal watering or fertilizer. Golden crown beard and the related species encounter few problems other than deer. Several species of caterpillars can feed on the foliage. Seeds of some species are available from Native American Seeds.

Bee Value of Golden Crown Beard and Related Species

Crown beards and the related species are valuable bee plants since they bloom for such a long period. They're considered important honey plants in the Southeast, the Plains, the Southwest, and Hawaii. The honey has been described as amber to gold in color and very high quality.

At one time the golden honey plant was widely cultivated in the central states by beekeepers, but the other related bee plants haven't been as popular among gardeners.

English Ivy (*Hedera helix)*

A member of the Aralia family, English ivy is a particularly long lived species. This fast growing vine is hardy in zones five through nine. The plant was introduced to America during the Colonial Era.

The vine is widely grown in most areas. In addition, it has naturalized in the Northwest, the Southeast, the Gulf region, and parts of the Midwest as well as in a number of other states. English ivy typically becomes established in open woods, waste places, shady and rocky sites, and on walls.

Description of English Ivy

All parts of this plant are considered poisonous although no fatalities have been reported. This evergreen, woody vine has aerial, root-like appendages that can cling to stone and masonry or other type of support. The juvenile stage of the plant is generally trailing.

If allowed to spread on the ground, English ivy is usually less than a foot in length. When given a support, the stems can reach ninety feet in height.

The stalked, alternate leaves are typically toothed and lobed – usually with three to five lobes. The foliage is two to four inches long. The leaf color ranges from deep green to bright green. Some cultivars have variegated leaves.

The size and appearance of the leaves can vary widely, depending on the cultivar and whether the growth is juvenile or adult. The youngest foliage tends to be heart shaped. On the other hand, the arborescent stems bear entire or unlobed foliage with an oval to diamond shape.

Appearing in late Fall, the yellow-green blossoms form large, rounded clusters. Largely hidden by the foliage, these can release a slightly unpleasant fragrance.

The flowers are followed by round clusters of small, black fruits that resemble berries. Birds love these fruits, which serves to aid the plant's spread.

Algerian ivy, sometimes called Canary ivy, is a subspecies of English ivy. It has naturalized in some areas of California. Hardy to zone eight, this only reaches 15 feet or so in length, depending on the cultivar.

The foliage of Algerian ivy is slightly sparse compared to that of English ivy. But otherwise, the two plants look similar. Like English ivy, Algerian ivy is a rich source of nectar and pollen.

The Pros and Cons of Growing English Ivy

There are many reasons that English ivy is so widely cultivated. It is an immensely popular, adaptable, reliable, low maintenance species that thrives in most soil types and exposures. The plant is readily available.

Yet, despite the plant's many positive qualities and its bee value, I feel reluctant to promote its cultivation in those situations where it might naturalize and displace native plants. When good growing conditions are available, the plant can become aggressive and naturalize on a local basis. This is more likely to occur in warm areas. In some locales, such as Oregon and Fayetteville, Arkansas, bans are in effect that prohibit the plants from being transported, sold, or propagated in affected areas.

In Oregon, English ivy has invaded natural areas and forests. Though this plant is by no means a parasite, it is capable of harming trees in two ways. First, over a period of time, the vine robs the tree of sunlight, which will eventually result in the gradual decline and death of the tree. In addition, the weight of the vine can sometimes actually topple a tree.

Bee Value of English Ivy

English ivy is a favorite among bees, and is one of the last plants to bloom, usually from September into December, depending on location. Blossoms arise only on the adult or arborescent growth of the vine. So long as the plant is growing and spreading on the ground, the flowers won't emerge.

When English ivy blooms, the plant will inevitably be humming with bees. The pollen varies from brownish-pink or yellow to yellow-orange. These flowers produce so much nectar that the drops are clearly visible. Quite concentrated, this arises mainly from the greenish-yellow disk around the styles.

When the bees are collecting English ivy nectar, the apiary will have a characteristic, pleasant aroma, which is retained over time.

English ivy can yield a small honey crop, 20 pounds or so per colony. With a pleasing flavor, the green honey is rather thick bodied with a high glucose content. Tending to granulate rather quickly, it develops fine grains. BC

Connie Krochmal is a beekeeper and plant expert living in Kentucky.

Bee Farming In The UK

Tony **Harris**

In the previous article my co-author, Ann Chilcott, wrote an informative background piece on the development of the bee farming industry in the United Kingdom (UK) and explained how geography and climate influence and limit the success of beekeeping in this part of the world. This article is how I moved from being a hobby beekeeper to the professional ranks and the challenges faced in keeping bees in northern Scotland.

The obvious challenge in keeping bees in northern Scotland is the cooler climate and less bee forage compared to parts of England and mainland Europe, meaning that the average yield per hive is considerably less. My yearly average per hive is about 70lb of honey, rising to 150lb in a good year. This can be sold for an average $4.62 per lb in bulk or $6.61 per lb if sold in jars. A hive will therefore on average generate between $320 and $460 of income annually from which needs to be deducted the costs of production.

In comparison, a bee farmer with the same number of hives in England will get four times more honey so the financial return is greatly enhanced by keeping bees just 400 or so miles further south.

The unpredictable nature of the weather, and therefore the honey harvest, also means that a bee farmer cannot operate like a traditional business. Sure, a business plan with goals and targets is useful but when the bank manager asks how much honey will you produce a year, the response of, 'well that all depends on the weather', doesn't go down well and therefore it is unlikely that a prospective bee farmer will get funding from a bank for a start-up business.

To acquire an additional 100 or 200 hives, at a cost of $330 per hive, requires a financial outgoing of between £33,000 and $66,000 and without the means of obtaining a loan, it is beyond the reach of most amateurs, who usually grow their hive numbers organically by making splits.

I work on my own and currently run about 150 hives. It is just about possible to make a sustainable income from that, although the wise bee farmer in the UK will diversify,

A unique, clean cut label is important!

Oilseed rape can provide an abundant Spring crop.

Yeah, it Looks Like Jewelry...
But You Can't Wear It!

Introducing the Civan line of extractors.
See them at the EAS Trade Show at

SOUTHEAST BEE SUPPLY

Tony's honey room, a converted shipping container.

to ensure money comes into the business when the Summer is a washout, and during the winter-time when the bees are tucked up in their hives. The old adage of 'not putting all your eggs in one basket' is particularly apt for UK bee farmers. I am fortunate enough to earn approximately a third of my income teaching beekeeping and this is a very welcome addition to my business model.

How I started beekeeping

Shortly after retiring, in 2005, aged 44, from a 22-year career as a police officer in England, my wife and I bought a derelict farmhouse on the Moray coast and drove the 400 miles to an exciting new life in northern Scotland. We lived in a caravan (trailer) while we made the house habitable and embraced country living, growing our own vegetables and keeping chickens and ducks. I thought that a hive or two of bees would assist us in living 'the country life' so I went along to the local beekeeping association, and, before long, took delivery of my first three colonies of Scottish 'black bees'. I caught a bad case of 'bee fever'. Beekeeping became a passion and by 2014, I was happily running about 50 colonies of bees in traditional Scottish Smith hives, all situated along the coast. I was making a small amount of money by selling honey, queens and nuclei in the local area.

W.W. Smith, often referred to as "Willie Smith of Innerleithen", was a pioneer bee farmer in Scotland in the pre and post-World War II years and he developed his hive specifically for the ease of moving to the heather, with top bee space, 'because one can break the joint and lift off the chamber without dislodging the frames'. It is not a square box, rather 18 inches by 16 inches so has short lugs (ears) like Langstroth frames.

Willie depended on the Ling heather crop to make a living and has been described by some as one of the greatest ever Scottish beekeepers. He considered the three most important factors for successful beekeeping as, 'firstly, one must have a deep interest in the bees themselves. Secondly, a good strain of bee. Thirdly, a good district for honey production. Fourthly, standard equipment of simple pattern.' *1

Making the Transition

Whilst working 12-hour shifts as a security officer at a local factory and, after a particularly boring shift, I decided that the time was right to leave my job and dedicate all my time and effort to developing a bee farming business. I must make the point that my police pension meant I was not going to lose my house if the plan did not work out, but it was still a risk. I did not have lots of cash to invest so I decided to work with what I had and develop my business progressively over a period of several years. I named my business Speyside Honey and Bees, opened a business bank and registered as self-employed for tax purposes. I decided that I wanted to run a maximum of 200 colonies and that my sales would be kept within a 60-mile radius of my home with the product marketed as premium local honey in jars.

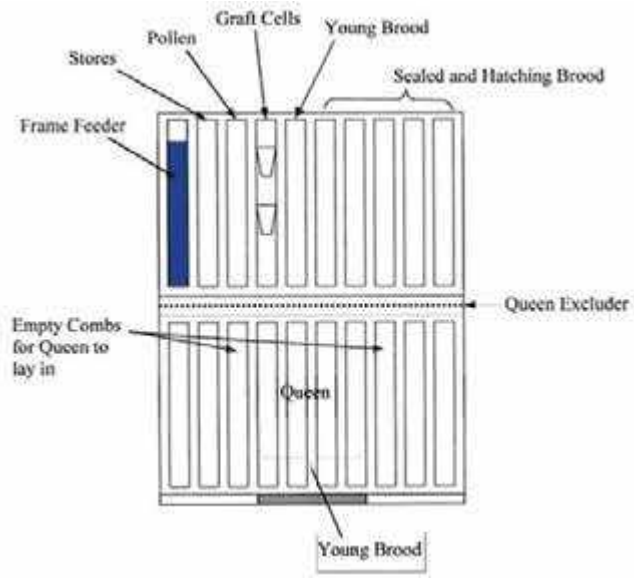
One major drawback to starting a commercial beekeeping operation was the lack of support or training available, even from the Bee Farmers Association, the U.K. trade body for professional beekeepers. Although an experienced beekeeper, I had never run a business before and stumbled along trying to make sense of record keeping, invoices, tax returns etc. I did receive two pieces of good advice; treat your beekeeping operation like a business and invest in bees as it is the bees that make the honey.

Branding

A unique clean-cut label is important for brand recognition so I spent some time designing my own label and I am delighted with the final outcome. Customers now ask shopkeepers for the honey with the stag on the label and they also spot the Scottish saltire (diagonal cross) hidden in the design. I started selling my honey at a local farmers' market and at larger country shows and this allowed me to build up a loyal customer base which has become quite lucrative. I also distribute honey bee conservation packs and leaflets promoting bees and pollinators and this has led to quite a few individuals

Brush uncapper.

Tony's double brood box system.



taking up beekeeping and buying bees from me later.

Developing the Business

As 2015 dawned, I was offered the opportunity to buy 40 colonies of bees from a beekeeping friend who was downsizing and the good news was that he said I could pay in three instalments of $2700, spread over 12 months. It was too good an opportunity to miss, so, in late April, I transported these colonies over 200 miles to Moray, where they were placed straight onto the flowering oilseed rape, similar to, but a different strain of Canola, grown in the U.S. and Canada. This brought my hive numbers up to 100 and the bees produced just over one tonne of rape honey, half of which was sold in bulk for $3,300. It was the first decent money I had made from beekeeping and I remember walking into the kitchen, placing the cash on the table and saying to my wife, 'buy yourself something nice', and 'book us a holiday in the Fall'. My wife Pat is not a beekeeper but she suddenly became interested in the bees and four years on, she has become more important in the business, jarring, labelling and delivering honey, while I concentrate on managing the bees.

I invested some of the honey sale profits into package bees imported from Italy so by the end of 2017 I had managed to expand the number of hives to 150.

Migratory Beekeeping

Living in such a northerly location means that it is not possible to earn an income from pollination contracts without making a return trip of over 1200 miles. It can be quite lucrative for bee farmers in England, who can earn $100 a hive for a three or four-week period, pollinating cherries, apples, pears, etc.

To maximise my honey crop, I move most of my colonies to the oilseed rape (*Brassica napus*) in late April. Colonies are stimulated by feeding small but regular amounts of sugar syrup in a contact feeder from mid-March and this assists the colonies to build up so they have a huge foraging force when the rape is in flower.

Summer forage consists of white clover (*Trifoleum repens*), bramble (*Rubus fruiticosa*), rosebay willowherb (*Chamerion angustifolium*) thistles (*Cirsium species*) and Linden (*Tilia species*).

Extraction Facilities

No doubt tired of the sticky floors and door handles, I was eventually evicted from the kitchen by my wife so I bought a 7.3 m (24 ft) shipping container and converted it into my honey room. It is supplied with water and electricity and is fitted with a large stainless- steel sink unit and worktops.

I uncap frames using a brush uncapper and use an electric, 24-frame swing basket tangential extractor to process the uncapped frames. Honey is strained directly into 21 kg (46 lb) storage buckets. Before jarring, honey is warmed in a home-made warming cabinet and filtered through a fine mesh.

Colony Management and Swarming

My bees are known as 'Buckfast bees' a strain developed by Brother Adam, a famous bee breeder in England and they are very productive, calm on the comb and well-suited to the climate in Scotland. They have an added benefit in that they are not swarmy which means I can take more of a risk-based approach to swarming. I keep the bees in double brood boxes and this extra space, along with early supering, and using queens no older than two years old, which means that eight out of 10 colonies do not swarm.

I mark and clip all my queens each spring and carry out regular 14-day inspections from May to the middle of July until unsealed queen cells are seen. These involve a quick look for queen cells by tipping the top box and looking along the lower edges of the combs it contains, where swarm cells, if present, are usually to be found. I will take the queen, some brood and bees into a nuc as part of my swarm control and also take nucs out of strong colonies before they go into swarming mode as part of a swarm prevention. I also locate lots of bait hives near my apiaries!

Queen Rearing and Production of Nuclei

I have been rearing my own queens and creating nuclei since 2012. These are used for re-queening or replacing my own colonies when required and others are sold locally. I usually raise about 100 queens and make up 50 nuclei which I sell for $225 each.

Queens are sold for $40. I use a method which involves grafting larvae from a number of my best stocks and raising them in a populous queenright double-brood colony. The advantage of this system is that there is no break in honey production for the cell-raising colony as the queen continues laying in the bottom brood box. With a few manipulations of brood between the boxes and the addition of more grafted larvae, it is possible to keep queen rearing going all season. The beekeeping season is remarkably short compared to the U.S. starting in April and finishing for most at the end of July. The queen rearing season is even shorter. The earliest I can start is the third week in May and I am finished in August so there is a lot to do in a relatively short time. Ripe queen cells are either placed into queenless nuclei or mini-nuclei for mating. On average, I have about 85% mating success.

2018 Season

Scotland and the rest of the UK was hit with a prolonged spell of cold weather in the spring of 2018 and bee farmers were fearing the worst. This bitter weather front was named 'the beast from the east' and it delayed the onset of spring by about four weeks. Then, just when we thought it was going to be a disastrous year, the sun came out, and it stayed out all Summer, making it one of the best years for summer honey in decades. I harvested about three tons of Spring and Summer blossom honey which is an excellent year for me!

The perils of bee farming in Scotland were evident, however, as the lucrative Ling heather crop (*Calluna vulgaris*) was a complete failure for most of us. It was just too dry on the mountains and the heather didn't yield any nectar, adversely affecting my business as I ran out of heather honey by Christmas.

The good news is that Scottish and UK honey continues to command a high price. As of March 2019, the price for Scottish heather honey is $12,814 per metric tonne, $5.81 per lb, and Scottish blossom honey is $10,193 per metric tonne, $4.62 per lb.

I do enjoy my bee farming although it is hard work! Not many people are fortunate enough to be able to turn a hobby into a job and whenever I even consider having a moan, I think back to those boring shifts in the security gatehouse.

Next we'll look at how the larger Scottish bee farming operations work, in particular how they are geared up for the heather harvest. BC

**1 February 1963 edition (Vol. XL, No2) of "The Scottish Beekeeper", the magazine of the Scottish Beekeepers Association*

Heather **Sosnowski**

This Fall presents a unique opportunity to attend an Apimondia Congress in North America! From September 8 - 12, Apimondia, or the International Federation of Beekeeping Associations, is having its 46th Congress in Montreal, Quebec. After a few years of hard work by the organizing committee headed by Pierre Giovenazzo of Laval University, Rod Scarlett of the Canadian Honey Council, and Stephen Pernal of Agriculture and Agri-Food Canada, the opening of this distinguished event steadily approaches. This conference represents a one of a kind occasion to learn about current beekeeping research from around the world, meet a wide variety of industry representatives, and explore topics of interest in beekeeping from many different perspectives.

In recognition of the close relationship between pollinators and farming, the health and productivity concerns that these areas share and opportunities for knowledge transfer and collaboration, the theme of this year's Congress is 'Working together within agriculture, Canada's answer to sustainable beekeeping.'

The opening ceremony of the Congress will take place on the evening of Sunday, September 8 and it is open to all registrants coming from across the globe. Along with welcoming addresses from the organizing committee, Apimondia officials and representatives from the City of Montreal, a short film showcasing beekeeping across Canada will be presented. There will also be a show by The Jerry Cans, a Juno nominated band from Iqaluit, Nunavut whose music is a combination traditional Inuit throat singing and roots-rock, sung in the Indiginous language of Inuktitut. This will be an enjoyable evening for all attending.

Key areas of interest which will be covered at the Congress are organized around seven Scientific Commissions related to apiculture: Beekeeping Economy, Bee Biology, Bee Health, Pollination and Bee Flora, Beekeeping Technology and Quality, Apitherapy, and Beekeeping for Rural Development. The four keynote speakers, well-known scientists and researchers in their fields, were chosen for how their individual work aligns with current concerns in beekeeping as well as for continuity with the seven commissions.

Gene Robinson, a professor of Entomology at the University of Illinois at Urbana-Champaign, is also director of the Carl R. Woese Institute for Genomic Biology, and director of the Bee Research Facility. His lab has been doing ground-breaking work developing large scale genomic resources to address questions around eusocial evolution in bees and wasps in an effort to understand the maintenance and elaboration of social life. Dr. Robinson's keynote speech will focus on the evolution and mechanisms of social behaviour, and in related symposia following this keynote, current work in honey bee genomics, biology and semiochemicals will be covered.

Rufus Isaacs is an extension specialist in the Department of Entomology at Michigan State University whose team focuses on insect pest and pollinator management in farming. He has also been helping to guide the Michigan Pollinator Initiative which works in pursuit of research-based solutions for beekeepers, growers, land managers and policy makers to provide economic and ecological stability. Dr. Isaacs will deliver a keynote speech on Integrated Crop Pollination, an agricultural project in Michigan that investigates the performance, economics and farmer perceptions of different pollination strategies in various fruit and vegetable crops (icpbees.org). Related symposia following his talk will include honey bee and non-apis bee pollination, as well as pollination and flora with environmental change.

The work of Peter Rosenkranz has included research on the host-finding behaviour of *Varroa destructor*. His interest in honey bees comes from a scientific as well as a practical perspective, as Dr. Rosenkranz runs his own beekeeping business. He is the director of the Apicultural State Institute at the University of Hohenheim, and has also worked in applied research in bee pathology, extension work and honey bee breeding. His presentation, Worldwide Perspectives on Bee Health, will be followed by symposia which include breeding for mite and disease resistance, as well as issues concerning emerging diseases and pests which will be delivered by the World Organization for Animal Health (OIE), the intergovernmental organization responsible for improving animal health worldwide.

The final keynote speaker will be Thomas Seeley, Horace White professor of Biology at Cornell University. He teaches animal behaviour and studies the behaviour, social life and ecology of honey bees. He is highly regarded among beekeepers for his popular books on honey bees which are indispensable texts for those interested in this field. He is also well known for his research on feral honey bee colonies, how they differ from managed colonies and how they are able to survive and adapt to pests and disease. Recognizing that honey bees have a long evolutionary history, he applies this perspective to beekeeping to account for their ability to adapt by way of natural selection, and calls this Darwinian Beekeeping. Thus the focus of his keynote speech, and a related symposium on natural and forest beekeeping will follow.

The seven commissions will be covered in a wide variety of symposia which take place throughout each of the four days, following these keynote presentations, and in one of the main conference rooms, the oral presentations will be translated into French and Spanish. Over 940 abstracts from scientists engaged in cutting-edge research around the world have submitted their work to be considered for inclusion in this year's Congress; some of these have been chosen for oral or poster presentations. The poster presentations will be located in an area easily accessible from the main conference rooms, and by many are considered to be the heart of the Congress, offering the opportunity for presenters and participants to interact. There are also several Round Table discussions being held concurrently with the symposia, offering participants to discuss current issues with visiting experts and scientists, as well as "cross-cutting" symposia, bringing two or more commissions together where areas of interest overlap.

The submitted abstracts have been rated by the seven Scientific Commission Presidents of Apimondia as well as the Canadian scientific program committee, which is comprised of 28 members from across Canada (many of whom are members of the Canadian Association of Professional Apiculturists or CAPA), and a few from the U.S. Leading this local scientific committee is Stephen Pernal, who has brought 25 years of experience in apicultural research into putting together an extensive scientific program which is representative of current research and popular areas of interest.

The local scientific committee includes sub-chairs, specialists in their fields, who have played key roles in rating abstracts for each of the seven scientific commissions. These include Gard Otis from the University of Guelph, in charge of Rural Development; Johan van den Heever, an analytical chemist with Alberta Agriculture and Forestry in Edmonton, Alberta, for Technology and Honey Quality; Shelley Hoover, Apiculture Specialist for the Alberta Ministry of Agriculture and Forestry, for Pollination; Ernesto Guzman, Professor and Director of the Honey Bee Research Centre at the University of Guelph, in charge of Bee Health; Stephen Page of Agriculture and Agri-Food Canada is working on Beekeeping Economy, Rob Currie at the University of Manitoba for Biology, and Stefan Stangaciu, President of the Romanian and German Apitherapy Societies, in charge of Apitherapy.

The organizing team has placed more emphasis on the inclusion of workshops the year, most of which are being held in the evenings after the regular symposia, with a few being held concurrently. Some of the topics of these workshops and their presenters include: Honey Sensory Analysis with Raffaele Dall'Olio, Opportunities for Youth in Beekeeping with Dr. Robyn McCallum (sponsored by CAPA), Bees in the City: Biology, Regulations and Thinking Big with Dr. Andony Melathopoulos (sponsored by the Canadian Honey Council), and How to Create a Successful Beekeeping Development Project with Dr. Gard Otis (sponsored by VITA North America). These workshops are a unique focus at Apimondia 2019, an opportunity for learning in the atmosphere of a small group with recognized experts.

Another Canadian touch to this year's Congress is a focus on successful beekeeping businesses from around the country from a diversity of operations and geographies. These will be presented in two separate symposia during the Congress, and will include an Alberta operation with thousands of colonies, Ontario honey packers, queen and nuclei producers, a focus on beekeeping in Atlantic Canada and a honey producer in Saskatchewan. There is also a focus on three Quebec beekeeping operations in the technical tours, through which participants can visit these successful businesses to discover their beekeeping traditions, expertise, and products.

The World Beekeeping Awards a global contest of all things related to beekeeping, and everyone is encouraged to enter! It is an opportunity to have your hive products brought together and judged with those from across the globe. Categories include honey, beeswax, meads and other honey beverages, cosmetics and medicines. There are contests for best innovations and inventions for beekeeping, and also for books and magazines. Honey quality is a theme of the conference, and as something new to this year's Congress, all honeys which are brought to be evaluated as part of the World Honey Competition will be tested for authenticity using Nuclear Magnetic Resonance (NMR) spectroscopy. Honeys will also be tested for acidity, moisture and presence of antibiotics, among other qualities. Contest rules are posted on the Congress website under the "World Beekeeping Awards". All honey classes that are required to be sent for laboratory analysis must be received by July 20, 2019.

Last but not least, there is the ApiEXPO – the biggest beekeeping trade show you'll have the opportunity to visit. The current list of exhibitors, which is at over 200 and growing, includes manufacturers of beekeeping equipment and attire, companies specializing in bee nutrition and hive technology, beehive product and stock producers, as well as educational institutions and beekeeping associations. From the latest innovations in hive components and bee health products, to current advances in hive monitoring from companies around the world, there will be something here for everyone, regardless of the size of your operation.

More information about this year's Congress, including registration, schedules, travel details and hotel accommodation can be found at **www.apimondia2019.com**. The deadline for hotel registration is July 24, and the deadline for online registration for the Congress is July 31. We hope to see you there! BC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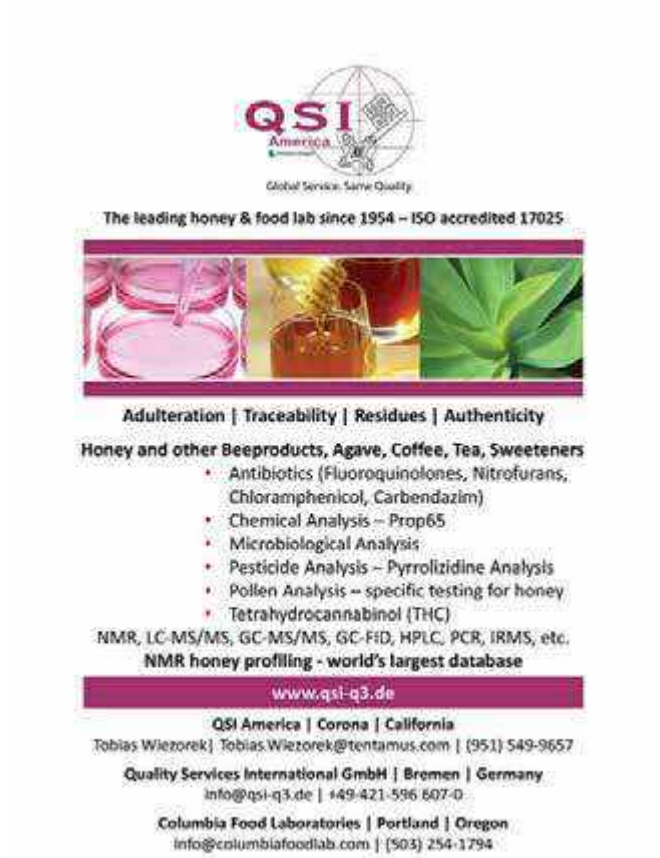
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NEW LIFE TO AN OLD

I call myself the 'unintended beekeeper' of Maryland's largest community garden beeyard at Filbert Street Garden in Southern Baltimore. My involvement with Filbert Street Garden began with me just wanting a place to put some nucboxes and somehow evolved into 20+ hives on the property! I guess always desiring to expand is just the nature of being a beekeeper.

Usually community gardens are not sustainable. They consistently need grants and community donations to function. I'm proud to say honey sales have closed that door and helped our non-profit become sustainable. Thanks to the generosity of beekeepers throughout the region donating old equipment, we've become sustainable.

However, my four-frame hand cranked extractor was no longer meeting my needs. Great tool, but once you're beyond 100 frames the hand cranked extractor was making me feel like I was pitching a double header every day of our harvests.

Radial extractors with higher capacities are great pieces of equipment for larger harvests. The $1300-$1500 price tag put them out of consideration for us.

Until a lucky find.

A local farm was being cleaned out of old equipment including a 1920s A.I. Root Simplicity Extractor. These old extractors are easily disassembled with a handful of bolts. This model existed from the 1920s into the 1950s with few changes to its design. The poor thing had been out in the elements for close to 20 years but was still in good shape. The radial extractor could spin 24 frames at a time using a simple ½ HP motor.

It was blanketed in rust, but with just under $200 I had the 400+ lbs extractor freighted to my home and began by disassembling it.

ROOT EXTRACTOR

I unseized the gears and mechanisms slowly, finding the cast iron to be amazing quality.

There were a few challenges with these old galvanized extractors. Rusted zinc can contaminate honey and the seams are all sealed with lead. Thankfully, products like Camcoat are sold by beekeeping supply stores to give older equipment food grade seals. In addition, I needed to remove the rust in a non-toxic way.

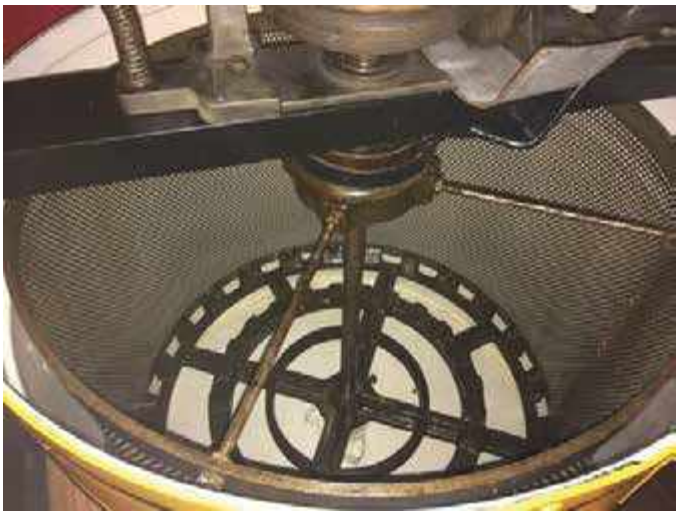
I broke the project into two different focuses – the gears/inner cage and the tank. Both required different approaches.

The gears and inner cage needed all rust removed. I used citric acid to dissolve the rust and brushed each part with a brass brush. I picked citric acid as I did not have to worry about touching it or dumping it down the drain later. The inner cage was 26" in diameter and the largest part. For that, I filled a kiddie pool and set a two-hour timer to rotate it. After three days of this process combined with a circular brush wheel on my drill, I had it looking new.

The tank was a unique challenge. I put in five gallons or water and found there were two small holes that needed filled in with food grade sealant. By removing rust, I would be thinning already thin walls in the tank. I decided instead to use rust converter which changes rust into a hard-shell coating you can paint over. I applied it to the rust spots and gave the tank a good paint job inside and out. This allowed me to be a bit artistic choosing a honey bee gold with black stripes. I sealed all of that with some Camcoat.

On reassembly, I used food grade grease to ensure the exposed metal gears did not rust again and the machine moved effortlessly.

The 1950s motor that came with it worked still but had lost some of its strength. Its addition was a modification on the original design. I switched it out for a modern motor and placed it to the side like the original design did.



Reassembly and starting the extractor up for the first time in 20+ years was priceless. The finishing touch was the old A.I. Root 'clover logo' that was on most of the old Root equipment. I could not find a digital copy of it anywhere and had a friendly graphic designer reproduce it as a sticker for me.

I'm proud to have this nearly 100-year-old machine up and running. The largest set back is how heavy these machines are. However, I don't have to worry about a wobbly extractor! I did my first harvest of surplus honey left over from winter and the extractor did an amazing job.

I can honestly say the revitalization is one of the most exciting projects I have done. Figuring out the best way to approach each step of the revitalization was a good kind of challenging. It also got me into looking at a number of old Root Beekeeping Supplies catalogs from 1900-1950 including many old issues of *Gleanings in Bee Culture*. I felt it put me in touch with the innovators 100-150 years ago that created modern beekeeping and many of the tools we use today.

Looking at these old publications you see many first-hand accounts of beekeepers and their challenges and successes which aren't so dissimilar from ours today.

I'm excited about this season and its possibilities. I'm looking forward to putting this extractor to good use! BC

KIM FLOTTUM

In Business with Bees

How to Expand, Sell, and Market Honey Bee Products and Services Including Pollination, Bees and Queens, Beeswax, Honey, and More

THE SOLAR WAX MELTER

This solar wax melter utilized a double pane replacement glass window for the lid. Built for maximum efficiency, it will melt wax on sunny days when daytime temperatures never get over 60°F (16°C).

Beeswax is a wonderful and profitable consequence of beekeeping and honey production. Cappings removed during honey harvesting, old combs, broken and damaged frames of comb, and hive scrapings can all be collected and the beeswax they contain cleaned, processed and reclaimed for a myriad of uses. Rendering beeswax by melting it down and cleaning it can be a labor intensive, messy and energy demanding job. This process is greatly enhanced, made easier and less expensive through the use of a solar wax melter. The solar wax melter is the most cost effective, least labor intensive, safest and most energy efficient means of melting down wax and beginning the wax cleaning process.

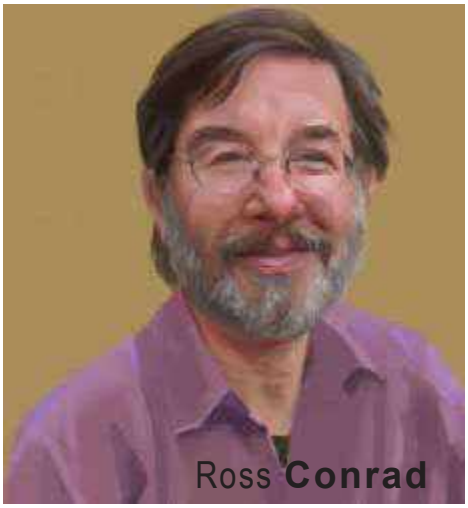
If you have yet to keep bees, or are new to beekeeping, you may never have heard of such a thing as a solar wax melter. Basically, a solar wax melter is a box with a transparent lid that allows sun to enter and hit a melting pan that holds the raw wax. A container that acts as a collecting pan is used to catch the wax as it melts. You can spend as much as $600 for a pre-made solar wax melter or build one yourself for very little money using scrap and used parts and pieces. While there are numerous plans and designs for building solar wax melters on the internet, not all wax melters are created equal.

The process of cleaning beeswax can be a time consuming job. Scrap beeswax, old comb and even cappings can contain a surprising amount of contaminants such as dead bees, larval skins, propolis, pollen, wax moth cocoons, flakes of paint and bits of wood or metal wires and nails. The process of using a solar wax melter to melt down your cappings and comb, naturally removes about 90 percent or more of these contaminants making the filtering process much easier and faster.

The average melting temperature of beeswax is around 145□F (63□C). Overheating beeswax and reaching the wax's flash point is a potential hazard when melting beeswax, but the solar wax melter removes the danger of fire. When you utilize energy from the sun to power a wax melter, it requires no electricity and therefore no acid rain, no nuclear power plants or nuclear waste, no consumption of the fossil fuels coal, oil and gas and their resulting green-house gas emissions. The use of a solar wax melter can be carried out year after year producing no pollution or damage to the environment. All the while it will help you produce rendered beeswax, a valuable commodity. Any honey left over in the hive debris being melted down will be over heated in the melter and ruined making it not usable. The slumgum however can be used to coat pine cones for fire starters (no waste), or save it up and have a professional renderer process it. (see "Wax Rendering" *Bee Culture*, April 2016) A professional renderer will use heat and a press to squeeze out the approximately 20% of the wax left behind after the wax melter separates out most of the beeswax from the rest of the hive debris that was collected along with the wax.

The most efficient design for a solar wax melter was evaluated by of E.J. Anderson at Penn State in 1960 and is mentioned in a book published by Roger Morse and William Coggshall titled, *Beeswax: Production, Harvesting, Processing, and Products*. Anderson found that the specifics of efficient solar wax melter design include the following:

The cover should be composed of a two panes of glass positioned around one quarter inch apart. While it was noted that a single pane will melt wax when the daytime temperatures are hot enough, a



Ross Conrad

double pane produces much higher temperatures inside the wax melter. It was further noted that the extractor works best when the glass is only five inches above the tray on which the wax to be melted sits, rather than higher. Care must be taken to be sure that nothing ever falls hard onto the glass lid or that the lid to the melter never slams shut; otherwise the glass is liable to break. For this reason some beekeepers might prefer to use the acrylic plastic, Plexiglass, or the stronger clear polycarbonate known as Lexan, when constructing the lid of the melter.

Another interesting piece of advice is that the wax melter should be painted all black on the outside, but painted all white on the inside. This is counterintuitive since black will tend to more fully absorb all the light and heat from the sun, and most folks would probably be inclined to paint the inside of the solar wax melter black as well. However, white produces better results because it reflects the light/heat that enters the wax melter, causing it to bounce around inside the melter and therefore increasing the temperature more than if a black interior simply absorbed the rays and heat.

To obtain the greatest efficiency from your solar wax melter, you may want to caulk the seams and use door or window weather stripping between the lid and the box in order to create a tight seal that keeps the heat in. At the same time, shadows, clouds and wind are all important considerations when it comes to maximizing temperatures in a wax melter.

It was also noted that it is very helpful to place a piece of foam board insulation underneath the metal pan holding the wax to be melted. The metal pan will get much hotter than the air temperature inside the melter as the sun shines down on it. I find that filling the catch container for the melted wax with some water will make removing the wax after it cools much easier.

There are a number of reasons why paying attention to efficient design is advantageous.

- It extends the season of solar wax melter use allowing for greater wax production
- It will melt wax on days when it is normally too cold to do so
- Provides the opportunity to potentially melt down two batches of cappings a day
- The higher temperatures will remove more wax from hive debris than lower temperatures

Since most of the debris and contaminants mixed in with beeswax is left behind in the solar wax melter, the final job of cleaning and filtering the resulting beeswax is made much easier.

While it will be tempting to build the box of your wax melter with a low cost material, I would suggest you spend the extra for marine grade plywood. Though it is pricy, marine-grade plywood is made out of hardwood laminated with waterproof glue so it will hold up much longer than regular plywood, pressure treated or otherwise. The layers of regular plywood when exposed to moisture over time will delaminate and fall apart. Marine grade plywood is not treated with toxic chemicals so it is not rot resistant or waterproof however, which is why a good water-resistant finish is recommended.

If you live in an area where bears are known to inhabit, it is a good idea to surround your wax melter with some kind of bear protections such as an electric fence since a large box full of beeswax smells like food to a hungry bear.

Beeswax processed through a solar wax melter tends to be a nice light yellow color and high quality. This may be partly due to the natural bleaching effect that the sun can have on beeswax, but is also due to the gentle way that contaminants in the wax are separated out. When beeswax or slum gum is processed by a commercial wax renderer, the extreme heat and pressure that the wax refuse is exposed to in the presses will force a lot of the pigments out of the pollen, propolis, and larval cocoons, and into the melted wax. This is why the wax will tend to be quite dark when rendered by a professional who is focused on getting the maximum amount of wax out of the material to be processed. When old comb, hive scrapings and honey comb cappings are melted down in a solar wax melter, most of the contaminants mixed in with the wax settle onto the melting pan, rather than flow into the catch basin with the melted wax. Not only does this preserve the lemon-yellow color of the wax but it also makes the rest of the process of cleaning and filtering the beeswax much easier.

Trying to melt down and filter wax refuse that has not gone through the pre-cleaning process of a solar wax melter is a miserable job since the large amounts of gunk and slumgum mixed in with the wax quickly clogs filters and dirties all the wax processing tools and equipment. To improve the pre-cleaning abilities of your solar melter, a piece of hardware cloth or metal screening can be positioned between the melted wax and the catch pan to help remove bug parts and other debris.

Melting down and cleaning beeswax is just like other beekeeping activities, there is more than one way to go about it. However, if you are looking for the easiest most productive way to render the wax that is produced as a byproduct of honey production and beekeeping, the solar wax melter is the way to go.

Ross Conrad is author of Natural Beekeeping *and co-author of* The Land of Milk and Honey: A History of Beekeeping in VT *due out this month.* BC

Reference:

Edwin J. Anderson, *An Improved Solar Beeswax Extractor*, Progress Report 225, July 1960, The PA State Univ., College of Agriculture, Agriculture Experiment Station, Univ. Park, PA.

You're Always One Decision Away From A Totally Different Life.

Absconding Beekeepers

And taking their bees with them

Yes, at some point, you will need to move your hives

Yes, you will need to abscond with your bees at some point. You and your bees will leave – but probably come back. I cannot say what the exact reason will be, but if you keep bees long enough, at some point, you will have to move hives in or out of your yard. It's normal bee management life. There are many ways, techniques, and specialized equipment for accomplishing this feat. In this article, I'm only reviewing aspects of one of those ways.

Beekeeper embarrassment made easy

I have a life's collection of bee stories that many of you have heard time and again. True, these events have become more golden and more refined as the decades have passed, but one thing has always remained constant – each of these events have had a lasting effect on me. For reasons specific to each story, my bee life has been permanently affected by the experiences. For example, consider the following saga.

How to kill four beautiful colonies before a live audience

In 1979, I was still a faculty infant at The Ohio State University. On an early, cold Spring morning, I was asked to deliver four university colonies to the state bee meeting that was being held about thirty-five miles away in Ashland, Ohio. For the big move event, I used a university pickup with a small, open freight trailer attached to it.

Though it was early Spring, the morning was cold, and the world was covered with a beautiful layer of hoar frost. These four pre-*Varroa* colonies were heavy – even frozen to the ground. Without help to load them, I broke the colonies loose, secured them with early pre-ratchet models of nylon straps, stuffed grass in the entrance, and rolled the four colonies up the trailer loading ramp. I lashed the hives to the front of the trailer. I could easily hear the harmonic hum of the strong colonies. Off I did go. On the way, I occasionally had passing concerns that the exposed colonies would become chilled. I worried.

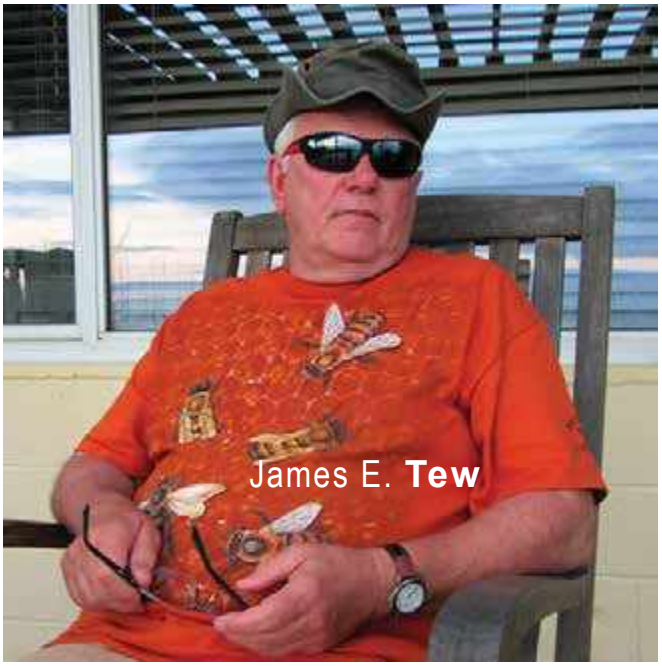
The trip was uneventful. With the help of Dr. Malcolm Sanford, Ohio State Extension Bee Specialist at that time, I unloaded the colonies at the temporary site. *At this moment, my predicament is how long should I drag out the story before I present the dire ending.*

I yanked the grass from the first hive entrance – expecting raucous defenders to come roaring forth. Nothing. Second and third entrance – nothing. With a sinking expectation, I opened the last one and nothing still. Well, at least there was no need for lighting a smoker. I removed the straps and opened the colonies to find that, the colonies had overheated and suffocated on that cold day. I was stunningly surprised. Simply speechless. On this cold day, I had overheated those confined colonies enough to kill them. How could that be possible? How *could* that be??? That was bad, but the situation was about to get considerably worse.

Within just a few short minutes, meeting participants were to come outside for an open-hive demonstration on Spring management of bee colonies. Like zombies headed our way, the beekeepers ambled toward Malcolm and me as they put on their protective gear. That was good for a dark humor grin. This was bee humiliation in its purist form.

In a snap of time, Dr. Sanford and I decided all we could do was present a discussion on Winter-killed bee colonies. Experienced beekeepers saw right through that ruse. As soon as everyone finished gasping, we told the truth about what happened and finally we really did discuss winterkills. That was how I introduced myself to the beekeepers of Ohio. Very impressive, Jim. Very.

Weather is not always great for a beehive move. Yep. Working in the rain. It's pretty miserable.



A Little Gray Hair Is A Small Price For All This Wisdom

I Can't Believe How Old People My Age Are!

Another episode would be too much for this article, but an interesting aspect of the second event was the frigid late night. I stopped my large, box truck in East Tennessee. I was hauling fifty colonies that were overheating in the cold, enclosed truck. On that cold night, I bought 300 pounds of ice from the night clerk at a convenience store. I'm sure he had many questions, but he didn't ask. All the while, I tried to look as though this was normal event.

Readers, why in the world am I revealing these painful events to you? Why? Because, for the remainder of my career – until this very day – I am antsy and concerned when I have bee colonies closed up. I am unable to relax. I know what can happen.

It's the loud hum of confined bees (To hum, a buzz)

Due to these two events and others like them, when my confined colonies are humming and otherwise making bombinating sounds, I am never at ease. I experience these lifelong emotions all over again. I will never forget them.

Some devilish details of moving colonies

My efforts here are not to review the broad recommendations and procedures for moving colonies, but rather a look at some of the incidental aspects of colony relocations. For instance, type of nighttime illumination needed when closing colonies after dark or trying to keep up with your hive tool in the dark grass *(hint – always have more than one)*.

Ratchet straps

When moving hives, ratchet straps are 80% heaven-sent, and 20% accursed devices. All of us should know the operational mechanics of this device and how to lace it and use it – in the dark. Read the instructions. Trying to describe that procedure here would be much like writing instructions on how to tie your shoes without using photos and diagrams.

Straps are off, brick ties loosened, screened moving box in foreground. I'm relieved. No colonies dead, but the bees did not enjoy the trip.

If you use the ratchet incorrectly and it catches your tender skin, there are multiple pinch points that will fire you up. It is a good idea to have the ratchet mechanism positioned clearly on the top or on the hive side, but not half on the top and the other half hanging over the edge. In this position, the ratchet process does not work smoothly.

If you are using screen tops made for empty deep supers and ideally covered in eight-mesh hardware cloth, the ratchet has enough torque to bow in the sides of the screened deep hive body. This high pressure – though great for securing the hive – can cause the ends of the hive screen to bow upward, possibly allowing an escape opening for excited bees.

Even with all these issues, I cannot recommend these strapping devices enough. I'm old enough to have used ropes and truckers' knots to lash colonies together. I still have a few of the pre-ratchet straps that were not as powerful as the modern ratchet strap.Try nailing wood slats on the sides? The hammering process drives the bees nuts. Years ago, commercial guys used metal banding. I have not seen that since the early 1990s. It's not for us.

Eight-mesh hardware cloth

As with ratchet straps, eight-mesh cloth is 80% heaven-sent, and 20% accursed. I use a pneumatic staple gun to attach the wire cloth to the top edges of an empty deep. Then I use tin snips to trim away the excess. The trimming process leaves hundreds of tiny protruding wire stubs that constantly shred my hands and fingers. Duh…. wear gloves. I always have gloves nearby, but hammering, lifting, stapling entrance screens – all in the dark – make gloves very clumsy to use. Try getting a one-inch screw from your pocket with gloves on your hands. I put them on, but invariably, they soon must come off. Yes, I use a hammer to tamp the protruding wire edges down, but they easily pull back up if anything catches them.

The empty deep hive body covered with a hardware cloth is directly related to my *confined-bee-paranoia*. A shallow super would probably work, but I want plenty of airspace. I travel with the outer covers off. Again, I want *plenty* of air available to the colony. Long ago, I frequently had to move hives all the way to Florida, so I carried a water hose allowing me to frequently stop and hose the bees down. Good solution. Easy – right? You try finding a water spigot at a service center where your loose bees will not cause a problem. You should know that there will always be loose bees and there will always be people watching you. This is not a great time to discuss pollination services with the observers.

Some of you might suggest aluminum screening, and that would work, but it is not heavy-duty enough for me. I have used this screening many times, but only for short, quick moves. I nearly always go for the overkill. My mantra is to *"Do too much to help forestall the unknown – whatever it may be"*.

Illumination for the hive move caper

I have tried many versions of night lights for moving hives. Obviously, all types of flash lights work to some degree. For years, I tried military red-lens lights. In theory, bees can't see red, but if I speak honestly, when using the dim red light, I couldn't see much either.

Round flashlights roll everywhere, but at least a

A colony brick tied, and ratchet strapped. The top deep super is empty and is covered in eight-mesh hardware cloth. Setting the hive on the empty super on the ground was a terrible idea. The hive required an improvised ramp to get the hand truck underneath the strapped hived. Bad idea that has to be solved in the dark. The brick ties are positioned in ways that avoid knots and wood blemishes.

lit flashlight is easily found. Presently, there are some spectacular Light Emitting Diode lights that can nearly blind you. They provide plenty of light. However, it you are the one holding the light, you can expect bees to come straight to you. They are not coming for solace and comfort. I wonder if any of you readers have found a good light for nighttime bee work? I have not checked into the types of lights simply because I am still using old technology.

I use a modern, traditional Coleman compressed gas lantern. It provides a bright light, and I can set it away from me to lure the cranky, lost bees to the light rather than to me. There is a side effect of using a gas lantern. Invariably, bees find their way through the bottom vents into the globe. I'm sorry to say that they do not survive more than a few seconds. As the poor bees are burned (not that many, but a few is enough), the bee yard smells like someone is cooking candy. Finally, it begins to smell as though someone is burning candy. Then the smell is gone - until the process starts again and more bees begin the cycle. I use this lantern, (1) because I already have it and (2) it gives out a bright global light. It gets HOT. Once it is turned off, make no mistakes with this hot gadget in the dark.

Corrugated wall ties

Is the use of "brick ties" for bonding beehive components together a common beehive idea? According to my brother, my *Great Depression Era* Dad who would find a use for nearly anything rather than toss it, picked up some used corrugated wall ties at a construction site. They were discarded. He was not pilfering.

Sometime later, Dad had the idea to use these ties rather than beehive staples to tack hive components together. Importantly, because of his frugal nature, he had some of these simple metal straps on hand and gave them a new purpose. They worked well enough to move his hives to watermelon pollination. The masonry ties cause the same damage as that caused by staples. As his colony numbers grew, he bought more of these ties instead of hive staples. He and my brother became believers in these short metal straps with predrilled holes. Classic hive staples work well but can be a pain. When hammering staples into the hive bodies, the bees really know that you are out there.

I must tell you that these metal brick straps are not for a beekeeper who is moving more than 10 colonies. For a few hives (I moved eight hives a couple of nights ago), I have found that they work very well. My brother actually cut them in half for even more efficiency of material. I didn't take time to do that.

I just attached the brick ties on the hive sides and then I used a ratchet strap on each hive to seal the deal. I think that if I had put the metal straps on the hive fronts and backs, the hive would have been bulletproofed. Know this, using either hive staples or brick ties on bee hives is hard work. Additionally, know this, too – nearly any brick-tied, strap-crunched hive can sometimes still shift enough to let some bees escape.

You can get most, but you will *never* get all . . .

When you move beehives, you will never get absolutely all of them to make the trip. I moved eight colonies and estimate that there are two hundred bees remaining at the original site. Sometimes a few bees bivouac outside only to return home the next morning. Other bees simply cannot stay in the hive as you drill, pound and strap. They get out or they were never in the hive and are now essentially lost. Once the hives are removed, they fly aimlessly about the area and cause neighborhood confusion.

Abandoned bees are not happy bees . . .

Expect these forsaken bees to be in a foul humor. The strange thing is that that will wander far afield. A neighbor two houses away – probably two-hundred and fifty yards – was bombarded by a lone, suicidal bee. It's too early for Yellowjackets, so I was caught without a defense by my neighbor. These few bees were all mine. I could only apologize and explain that these bees got left behind. They did not take it well. The problem would solve itself.

For the eight hives that I moved, I did the absolute best job I could to close them. Even so, I still had two colonies where bees found escape holes, and – one by one – bees got out. I had loaded these hives the night before, and these excluded bees became part of the testy bee cadre that patrolled the area.

You can do it...

Don't listen to me as your only source of information. Talk and read until you can form your plan. When necessary, you ***can*** perform your "hive move" project without (big) issues. During daytime, prepare for the nighttime. Expect setbacks but work around them. Some concern and worry will be necessary. Don't let them overheat.

Thank you for reading. I appreciate your time. BC

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

A video chat

https://youtu.be/bxBU3KojeVY

You Can't Always Get What You Want

Granny slips out at night,
Garden hose in her hand.
As the moon casts thin light
O'er the parched Texan land.

Her peonies, azaleas
Not looking so gay.
As she hides from the neighbors,
Water rules, POA.

Non-natives, "exotics"
They don't fare so well.
Down in our sub-tropic
Where July feels like Hell.

But revive them she must.
H_2O CPR.
Colorado turned dust
For the scent of one flower.

In the corner, forgotten,
Blown in like a weed.
Reviled, misbegotten
Where it grew from a seed.

A kidneywood growing
From the hard, rocky soil.
Year-round nectar flowing
For the honey-bees' toil.

It will not submit
To our strict beauty norms.
But it keeps hope's light lit
For a sea of life forms.

Honey bees, butterflies,
Seeking sanctuary, all.
To its bosom they fly
From the spring to the fall.

Beekeepers, homeowners:
Of our natives take heed!
S'not about what you want
It's about what you need.

Peter Keilty

If you have a garden and a library, you have everything you need.

Let's Go For A Drink

"Whew! It's hot up here on this rooftop. There's plenty of sidewalk cafes here in the city – let's go find what they have to offer for thirsty bees!" And so the bees from this rooftop hive head for the nearest café where the sweating drink glasses are sitting in their nice puddles of water. The result: screaming customers swatting at bees (fortunately missing all of them) and an enraged café owner trying to cope with the unfortunate situation.

Bees need water. In hot weather, drops are placed around inside the hive and air is circulated through. The evaporation of water cools the hive to keep an even temperature for brood rearing. Water is also necessary for diluting stored honey so it can be used by foragers for energy and for feeding developing larvae. Many honeys crystallize in the comb. Bees need water to dissolve the crystals to make that honey useable.

City bees will be found in hives in elegant back gardens, tiny back gardens all in a row, balconies and rooftops. The bees will find their floral sources scattered around everywhere but a source of water may be limited, especially outside of residential areas. Although publicity about honey bees and their problems has caught the interest of many people, that does not carry over into appreciating a real bee that is sitting on a café table next to someone terrified of any insect, most especially a stinging one.

Take a minute and think about possible water sources in cities and towns. Some people may have a bird bath; in some parts of the country small ponds and streams may be part of the landscape. Children may have a small pool to play in during hot weather. Some cities have rivers but these may have public parks on the banks. Dogs who spend much of their day outdoors will be provided with a pan of water. Potted plants outside of a café or a shop will have to be watered. Bees will find any splashed or residual water by those. Parks may have decorative fountains as well as drinking fountains. Puddles from rain are ephemeral but can be used by bees. Some municipalities may have outdoor swimming pools. Pools are also found outdoors at hotels and motels. Bees are definitely not welcome at these. The one bee that finds a water source will, of course, be followed by others from the hive. Soon, especially on a hot day, more bees will be found at the water source.

Bees are quite small so how much water do they really need? During cool weather a colony might only use up to a quart in a day. But in hot weather, or hot conditions such as rooftops, a single colony can use a gallon in a day. So you need to keep both the number of hives, their placement and the weather conditions in mind when selecting a way to provide a water source.

Not every bird lover will appreciate bees using the bird bath; not every dog wants to cope with bees in the water pan. So what can the urban beekeeper do to avoid the café crisis or the annoyed bird lover with the bird bath. Remember that bees were prohibited from being kept in most urban areas for a long time. Now, with the renewed interest in keeping bees along with the need for pollinator protection, those prohibiting regulations have been removed. However, if problems persist, regulations can be revived.

A number of things need to be considered in providing water for urban bees. One is climate. In the far south, especially in desert areas, a water source for bees will need to be provided the entire year. In climates with cold Winters with bees confined to their hives, their water source is needed only during months they are flying. Bees quickly learn their water source and will continue to use it as long as it is available. Therefore in cold climates water should be made available as soon as flying weather is possible. True, the water may freeze at night or even during cold days, but it is essential to train the bees as early as possible.

If you are just setting up an apiary, even if it's just one hive, in an urban setting, set up the water source at the same time. Scent the water initially with a food flavoring or Honey Bee Healthy. Then your bees will not go on a search for a source elsewhere. It will be essential to monitor your water source in urban areas. If the water disappears for any reason the bees will promptly fly out to discover a new source. They may or may not return to your original source after it has been refilled.

Once you have chosen a way to provide water, monitor it over a week. If your water system seems overcrowded with bees perhaps you need something larger or may need two or more water stations. Consider how many hives you have as well as consider if some of those bees are from elsewhere and are in need of water. If bees need water, go ahead and give it to them!

Do bees prefer "flavored" water or just plain tap water? Minerals are scarce in nature and tap water, probably the only source in urban

areas, may well be lacking in both taste and odor. Swimming pools have an odor and taste from the chemicals added to make them safe for humans to use. So swimming pools provide "flavored" water with an attractive odor. In rural areas honey bees are found visiting puddles or water troughs in barn lots where livestock spend some time. Odor and minerals are always available there.

For urban areas the gravity-fed waterers can be a good choice. The Boardman feeder, sold by bee equipment suppliers, is one type. It can be used as an "entrance waterer." However only a one- or a two-quart jar will work best at the hive entrance. During hot weather two quarts may not be enough even for one day.

Searching for different waterers can be done very well on the Internet – search automatic chicken waterers. True, many will be unsuitable for bees, especially the nipple type or the ones where the chicken must peck at a float. But you will find commercial gravity-fed ones that hold two gallons or more. In addition you can find plans to make your own from three- or five-gallon plastic buckets and even a large one made from a galvanized rubbish bin.

Bees like something to hold onto. Their feet end in a set of claws so they can easily grab onto something rough while obtaining water. Since the surface of the bottom dish of gravity-fed waterers is smooth and slippery plastic, adding a few floating twigs to the drinking area would be a good idea.

If you choose to use an open pan, adding twigs or floats of pieces of rough wood will greatly help the bees. Some books will suggest forming a bottom layer of small stones for the bees. However this arrangement can make it difficult to have enough water available in very hot weather and also make it difficult to clean if debris gets blown in.

In gardens with faucets for garden hoses beekeeping books will suggest leaving it drip onto some bricks or stones for the bees' water source. However, many municipalities caution against dripping faucets, whether inside homes or outdoors, as being wasteful of the town's water supply. Since people living in places with water service are being charged for water usage, and frequently an additional sewer charge, a dripping outdoor faucet could increase the monthly water bill. The drips may not look like much but over many hours those drips would add up. True, you could have a timer on the faucet but it would have to turn the faucet on at daylight and off at dark **every** day. If you had to do that, yes, you would forget. Then your bees might visit that neighbor's bird bath or children's pool.

In gardens, bird baths make an attractive bee waterer. Birds and bees will share the water source. Or you can put a bird bath in the apiary and another one near your bird feeders. Some bird baths are available with automatic refilling devices. These would be very handy since the amount of water in most bird baths is not very much. Another solution could be an automatic-refill large-dog waterer. The Internet is filled with ideas for both bird baths and for large-dog waterers. You want to search for "large dog" because those would have the quantity of water you need for bees. No matter which of these two you choose, the bees will appreciate some twigs or small pieces of rough wood to stand on.

Attractants can be added to the water supply. Products for bees that have lemon grass in them could be added in very small amounts. You might not be able to detect the odor, but the bees would. Farmers with livestock of all kinds have been using 50-pound Redmond Salt blocks for their animals. It is a pink-red salt mined in Utah that naturally has both ordinary salt plus naturally-occurring minerals. If mounted outdoors, rain will wash a bit down on the ground. When the ground is a little damp you will find bees, butterflies, other insects, squirrels and other critters eagerly licking the block or the ground under it. Minerals are scarce in Nature! You can obtain small amounts of Redmond Salt (called "Real Salt" in a 10-ounce shaker or a 16-ounce pouch) and add a pinch or two to your bees' water supply. They will appreciate it.

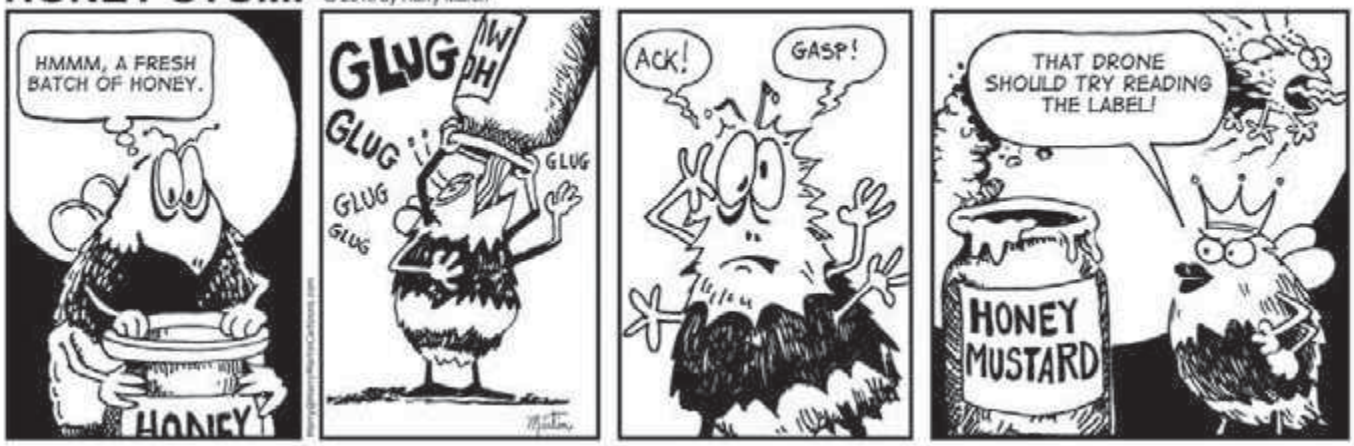
If your beeyard is a rooftop it can be a hot climate even in a cold climate area. Some rooftops now have been made "green" with many kinds of plants. These may actually have a source of water that you can use to refill your bee waterer. Other rooftops are just that – a flat roof covered with some sort of roofing material. Such roofs may get very hot. The bees can cope but your waterer might benefit from some sort of shade over it to prevent it from baking in the sun. Be certain that any type of shade will not blow off in high winds.

Have you thought about someone to take care of your water source when you go for an out-of-town vacation? The bees themselves in their hives may not need any attention but their water source cannot go dry. If you belong to a local bee club perhaps the members can assist each other for vacations. Even if you choose a watering source with automatic refill, have someone check from time to time, especially in areas of severe thunderstorms or high winds.

Consider your bees' water as important as sufficient food. Actually more so in urban areas where more honey bees are living now. BC

Ann Harman has been showing us how to keep our bees healthy for a lot of years from her home in Flint Hill, Virginia.

HONEY STUMP © 2019 by Harry Martin



CALENDAR

♦INTERNATIONAL♦

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

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

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

♦ALABAMA♦

The North Alabama Beekeepers Symposium will be held August 17 at Friendship United Methodist Church, Athens.

There will be presentations on queens, drones, mites and more.

For information contact **n4wm@bellsouth.net**.

♦CALIFORNIA♦

The 4th Annual International Conference on Pollinator Biology, Health and Policy will be held July 18-20 at University of CA, Davis. Reception July 17.

Early-bee registration is $325/person; $150/students. After May 15 $425/person; $250 students.

Keynote speakers are Christina Grozinger, Lynn Dick.

For information visit **https://honey.ucdavis.edu/pollinatorconference2019**.

♦GEORGIA♦

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

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

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

♦INDIANA♦

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

The keynote speaker is Randy Oliver.

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

♦KENTUCKY♦

Heartland Apicultural Society (HAS) will be held at Western Kentucky University in Bowling Green, July 8-10.

Keynote speakers will be Jay Evans, Jerry Hayes, Reed Johnson, Juliana Rangel, Jennifer Tsuruda and Geoff Williams.

For information visit **www.heartlandbees.org**.

♦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**.

♦OHIO♦

Native Bee Workshops coming to Ohio July 29 at Stratford Ecological Center in Delware and August 2 at University of Mount Union's Huston Brumbaugh Nature Center in Alliace.

The cost is $65/person and includes lunch and handouts. Sessions run from 9:00 a.m. to 4:00 p.m.

For information contact Denise Ellsworth, **ellsworth.2@osu.edu**.

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**.

♦PENNSYLVANIA♦

Summer Beekeeping 2019, Delaware Valley College, Main Campus, Feldman 122. **Introductory Beekeeping,** three sessions - July 26, 27, 28, $219. Vincent Aloyo is the instructor.

To register and get more details visit **www.delval.edu.**

♦SOUTH CAROLINA♦

EAS 2019 will be held at the Greenville Convention Center July 15-19.

Speakers include Dewey Caron, Dennis vanEngelsdorp, Kirsten Traynor, Geoff Williams, Meghan Milbrath, Jennifer Berry and Jay Evans.

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

♦VIRGINIA♦

Spikenard Honey Bee Sanctuary/Waldorf Workshop - July 10-13 at Spikenard Honeybee Sanctuary.

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

♦WASHINGTON♦

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

Speakers are Andony Melathopoulos, Randy Oliver and Kevin Oldengurg.

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

♦WEST VIRGINIA♦

WV Beekeepers Association Annual Fall Meeting will be August 23-24 at the Robert H. Mollahan Building of the WV High Technology Complex in Fairmont.

Featured speakers are Jamie Ellis and Dwight Wells.

For information visit **www.wvbeekeepers.org**.

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If you are having an annual meeting or teaching a beginning beekeeping class, we are happy to send you magazines to give to your attendees and students. BUT – we need to receive your request four weeks before your event so that we have time to process your request. Please email Amanda at Amanda@BeeCulture.com with the number of magazines needed, a complete mailing address and a contact person.

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An armed robber from up the road just called about nucs. I told him I'd sell him a couple. Twenty years ago, just out of high school, he was a member of a teen gang that stuck up a couple of grocery stores. A clerk got pistol whipped. Then, after he got out of stir, he got pinched selling cocaine.

Now this former bad boy has a wife and kids and lives in the country, with bees. I've done business with him before. He's always been a perfect gentleman.

Over at the honey house on a recent brisk early-May morning, Paul said, "Do you need any queens? I've got 30 extras." He asked at the wrong time. I was buried in queens, as I ran madly hither and yon, making nucs and splits. I wanted Paul's queens, because he generally finds good ones, but I simply couldn't imagine when I'd find the time to use them. So I demurred.

On my way home, Tina called from Durango. Normally she makes her own queens, but this time something went awry. She needed 20, yesterday. I said, "Paul's got some. I could overnight UPS them to you." She said, "What kind are they?"

I said, "Tina, I don't know, but sometimes the best queens are the ones you can get!" She couldn't argue with my logic.

You can't call the UPS depot 20 miles away in Glenwood Springs. You have to call India or Afghanistan to talk to somebody. When I inquired about the deadline for overnight shipping to Durango, the pleasant woman on the phone said, "You have until 6:30 p.m."

But I had this nagging feeling. At noon I called again, just to be sure. This time a different UPS phone representative said, "You have to get them to Glenwood by 1 p.m."

I knew it! I blew my gal Marilyn a kiss as I grabbed the queens and headed out the door.

I'm no saint. You might wonder why I went to such great lengths to help someone. But I am the Colorado Beekeepers president, and Tina's my VP and fiercest ally. A hundred times she's had my back. It was payback time.

UPS was closed, so I went in the back door and found Jo. She likes bees and squirts water through the woven wire ventilation windows on arriving queen boxes.

"We're technically closed, but I can take care of this," she said.

This is how the world should work!

The next day when Tina picked up those little darlings in Durango, she waxed ecstatic at how fat and gentle they were. She said her nurse bees accepted them immediately.

Today on the phone Tina said she called the California queen breeder Paul got those queens from and ordered 30 more. She said, "I really like this guy. He's kind of quiet, like Paul."

I said, "You mean he knows a lot, but you have to pry it out of him?"

"That's it!" she exclaimed.

It's nonstop around here. Our Colorado Beekeepers June meeting keynote speaker Jonathan Lundgren called from somewhere between here and South Dakota to say he'll arrive by 9 p.m., if a little Rocky Mountain snowfall doesn't slow him down. He's here a month early to pick up some research nucs that Paul and I rounded up for him. I said Marilyn's driving a school bus to Denver tonight for a Roaring Fork High School girls' soccer state playoff game tomorrow. (Go Lady Rams!) So they'll be passing like ships in the night. I told Jon to wave when the big yellow bus goes by.

They keep plowing up pollinator-friendly alfalfa around here and replacing it with wind-pollinated hemp. Hemp is a desert for bees. I took my first hit last summer at my formerly most productive yard, when a sea of dandelions and alfalfa got plowed up. Now an additional 160 acres of alfalfa, close to another productive apiary, has been converted to hemp.

That's not the end of it. At the first of the aforementioned hemp fields they plowed the ground a month ago. Still, lots of dandelions managed to poke their lovely yellow heads out of the tilled earth. I thought, "OK, maybe my bees can at least get a good start before I move them to greener pastures."

Then I heard a rumor they were spraying those fields. I went over to investigate.

They were dumping a granular formulation of Roundup, or glyphosate, on blooming dandelions. I asked the foreman if they might delay until after the dandelion bloom, which is to say a few more days.

"We're about done," he said.

I know this guy. I told him all he needed to do is call me before a chemical application, and I could advise him on how to do it with minimum impact to honey bees. He didn't seem impressed with my offer.

In my mind, the sin was not so much the glyphosate as it was putting it on blooming bee forage. They could have made their application before or after the dandelion bloom. In a pinch, they could even apply it during the bloom, but late in the day, or at night, when the blossoms are closed. Or I could have moved my bees, had I only known.

I checked the label, which declares Roundup to be "practically non-toxic" to honey bees. The bees look fine, but there's a growing body of evidence that even at low levels, glyphosate impairs bees' navigational abilities.

I blame myself for not being pro-active on this. I could work to make things better in the future, but I'm not going to. I'm getting the hell out of there.

Ed **Colby**

An Armed Robber