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October Features . . .

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POSTMASTER: Send address changes to
BEE CULTURE, The A.I. Root Co., 623 W. Liberty St., Medina, OH 44256

Subscription Information
U.S., one year, $25; two years, $48. Newsstand price: $4.99. All other countries, (U.S. Currency only), $20.00 per year additional for postage. Digital Edition $15. Send remittance by money order, bank draft, express money order, or check or credit card. Bee Culture (ISSN 1071-3190), October 2021, Volume 149, Issue 10, is published monthly by The A.I. Root Co., 623 W. Liberty Street, Medina, OH 44256. Periodicals Postage Paid at Medina, OH and additional mailing offices.

Subscriptions, Book Orders – www.BeeCulture.com • subscriptions@BeeCulture.com

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COMPARISON OF TREATMENT-FREE CULTURAL CONTROLS WITH FORMIC ACID *VARROA* MITE (*Varroa destructor*) TREATMENTS IN MANAGED *Apis mellifera* COLONIES – Please see page 89 for additional information to Ross Conrad's September, page 41, article.

In Every Month –

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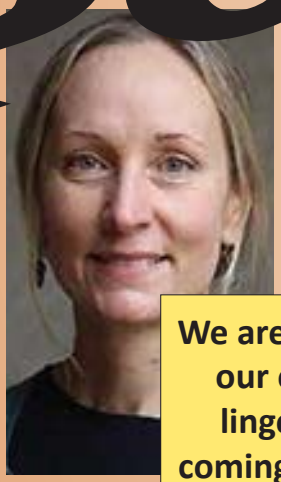
Postpo

Susan Cobey runs Honey Bee Insemination Service and holds a 50% appointment with WA State University. She founded the New World Carniolan Program, now in its 40th generation. Her focus is enhancement of honey bee stocks and improvement of colony health through selective breeding.

Tammy Horn Potter helped her f[illegible] father with his beehives begi[illegible] 1997. In 2006-2010 sh[illegible]orked [illegible] seasons wit[illegible] Queens i[illegible] waii. In [illegible] sh[illegible] Cou[illegible] Beewor[illegible]ce mine [illegible]anie[illegible]tablish po[illegible]tor habitat [illegible]piar[illegible] KY. In 2014, she [illegible]me th[illegible] KY State Apiarist, helping [illegible]ate the KY Department of Agriculture Pollinator Protection Plan, the KY Certified Honey Producers program, and the KY Queen Bee Breeders Association.



Geraldine Wright is the Hope Professor of Entomology in the Department of Zoology at the University of Oxford, UK. Her lab specializes in research on the physiology and behavior of bees. She has over 25 years of experience in insect nutrition and has worked with honeybees for the past 20 years. Her research program includes expertise in bee chemical senses (olfaction and gustation), the mechanisms of learning and memory, and bee nutrition.

Kim Skyrm is the current President of the Apiary Inspectors of America (AIA) and the Chief Apiary Inspector for the MA Department of Agricultural Resources (MDAR). Prior to these appointments, Dr. Skyrm received a Ph.D from OR State University focused on the environmental impacts affect-

We are sorry to announce that we are postponing our event until 2022! Due in large part to the lingering effects of COVID and with speakers coming from all different parts of the country and even outside the country, we decided we needed to be safe and plan for next year.
Please go ahead and mark your calendars for September 30 - October 2, 2022.

Nina Bagley has been an u[illegible] keeper for 17 years. Nin[illegible] with a master beekeeper [illegible] years raising queens. She h[illegible] al apiaries in the City, and s[illegible] her own Queens. Nina has [illegible] ed Dr. Joe Latshaw's inst[illegible] insemination class. She [illegible] ed the Master Beekeeping classes taught by Dr. Jerry Bromenshenk's program through the University of Montana.

Bee Culture would like to thank these very special folks for sponsoring our event –

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Barbara Bloetscher has been the State Entomologist/Apiarist at the Ohio Department of Agriculture since 2009, after 23 years at The Ohio State University Extension. As State Apiarist, she oversees the Apiary Program and identifies insects and other arthropods submitted by Ohio Nursery inspectors and bees. Barb monitors the County Apiary Inspection Program and addresses issues in the state.

Hunter [illegible] as President of the American Beekeeping Federation (ABF) as well as Trustee for the Foundation for the Preservation of Honey Bees. She is also active with the National Honey Board, the Honey Bee Health Coalition and the state beekeeping organizations of ND, MS and TX.

The Bee Informed Partnership (BIP) is a small non-profit organization with a broad reach. Our mission is to improve honey bee colony health across the U.S. We do so by working closely with beekeepers, researchers and different sectors of the industry. We assess colony health and report back to beekeepers so they can make data-driven management decisions in real-time. Seven women support multiple BIP programs including the Annual National Colony Loss and Management Survey, the Sentinel Apiary Program for backyard beekeepers, the Tech Transfer Team program in five regions across the country working with commercial beekeepers and a variety of other projects ranging from IT products to specific product and/or management custom trials.

Tracy Farone is a Professor of Biology at Grove City College in PA. She has worked in various areas of private practice, academia, and research for over 21 years. Since 2016, Dr. Farone has been researching beekeeping and bee medicine. In 2018, she was granted a sabbatical to allow additional time to pursue apicultural studies and develop a teaching and research apiary at her college. In 2019, she worked in the field with dozens of backyard, sideline, and commercial beekeepers. She visited France, where she worked with multiple experts in bee medicine and research at ONIRIS College in Nantes and the OIE in Paris. Additionally, she visited The University of Edinburgh and the Roslin Institute in Scotland, meeting with additional bee experts.

Maggie Lamothe Boudreau is the sole owner of "Rayons de Miel" a 350 hive farm that produces 4000 queens/year. She recently enrolled for a Master's Degree in beekeeping at Laval University in order to keep improving her knowledge of beekeeping sciences with the goal of improving research throughout Canada and more particularly Quebec. All this for the purpose of helping the beekeeping industry in its quest for self-sufficiency in bees and especially in quality queens. Canadian commercial queen breeders are currently unable to supply queens before the beginning of June. Without access to queens early in the season, the opportunities for beekeepers to save their hives or create nucs very early in the season is greatly reduced, if not impossible.

Jackie Park-Burris was born into the Park beekeeping family of Northern CA. She managed the queen rearing portion of her parents' bee business and after the unexpected passing of her beloved father, she purchased the business from her Mother. In 1994 Jackie Park-Burris Queens, Inc. was started. She has concentrated on breeding a healthier, hygienic, honey producing queen, even incorporating genetics from Italy to improve the diversity of Jackie's line of popular Park Italian Queens. Jackie has also continued the family tradition of being active in the bee industry. She has served as President of the CA State Beekeepers Association, the first woman President of the CA Bee Breeders Association and the first woman Chairman of the CA State Apiary Board. She has served on the CA State Beekeepers Association's board of directors for over 25 years.

Julianne Grose is an Associate Professor in the Department of Microbiology and Molecular Biology at Brigham Young University. Her university position consists of 45% effort for teaching, 45% effort for mentoring/research and 10% effort for citizenship. She teaches approximately 12 credit hours of undergraduate courses per year (approximately six courses) and currently mentors three graduate students and 15 undergraduates in her research lab. Her teaching is dedicated to bringing novel research experiences into the classroom through an international program, Phage Hunters (HHMI SEA- PHAGES program). Research in her laboratory is dedicated to two main projects: 1) the study of metabolism and its relation to disease, and 2) the study of microbiomes and their contribution to the health of organisms.

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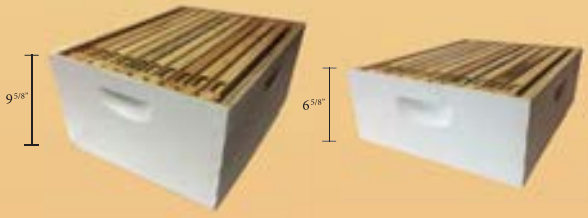

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STUDY HALL

RNAi For *Varroa* Control

Q – *After reading the item from GreenLight in your August issue, I've tried to find more information on the RNAi mite control. Looks like GreenLight purchased the technology from Bayer. I am hopeful that you (as the editor of BC) have contacted them and can share more information about this treatment (like where it is in testing/approval) in the September issue. Thanks! David LeGrys*

A – Hey David,

Might want to google up Jerry Hayes, RNAi, Monsanto, Wired magazine. Take care. *Jerry*

Jerry, thank you for this directed path to the Wired magazine article. I really felt I got to know you and was amazed at your dedication to bees as a Florida bee inspector, then working within the system at Monsanto to try and help bees, helping to set up the Honey Bee Health Coalition and now as editor of BC. Thank you. I wish every BC subscriber would read this article.

I assume that the large field trial did not go so well, perhaps hard to get the nurse bees to eat the syrup and get it in the baby bees. The Greenlight article in the August BC was so positive. I am terrified of a time of amitraz resistance. Here in central NC the temperatures are too hot to use (following the label) some of the organic options at the times we need to work on mite control.

Something like RNAi, with no mite resistance, in sugar syrup sounds like the answer to a prayer. Thanks again. David

A – Your first sentence, second paragraph is spot on.

Greenlights goal is to 'make' more of the RNAi faster and cheaper and elevate the active quantity in a dose to raise the potential of more RNAi getting to the food fed to the developing larvae. The real delivery is when the foundress mother mite submerges herself in the larval food to hide in this new cell. She has to take a couple gulps of the food which gives her the nutrition to be able to lay eggs when cell is capped and she emerges. If more RNAi is in the food delivered by Nurse Bees and is still active in syrup after three days in theory it should be effective on the foundress mite.

The above is a gamble for Greenlight. *Jerry*

Metarhizium For *Varroa* Control

Q – *Do you recommend using the fungus metarhizium on a hobby bee hive if so how much?*
Thanks, Curt

A – Short answer is no. One, it has not gone through the 'Regulatory' process to allow it to be sold and used with appropriate label directions.

Longer answer is that years ago I was involved in approved research field trials using metarhizium to control *Varroa*. Picture this, you spread these fungus spores onto honey bees in a honey bee colony hoping they get on a *Varroa* mite. You have immediately introduced 'trash' into the colony and the bees hygienic behavior gets geared up to clean this stuff up and out and remove it from the colony. Let's say most of it is removed by the bees but some does get on a *Varroa* mite and it stays there. At the time the strain we were testing had temperature and humidity requirements that the interior of a honey bee colony sometimes met and sometimes didn't for the fungus to grow. Sometimes it did stay on *Varroa* and grow and its mycelium would get into the *Varroa* mite and kill, hurt, damage it. But, most of the time it didn't stay, grow and control *Varroa* consistently. Soooo, the research project was dropped.

Fast forward to 2021. Maybe there is a better more adapted metarhizium but you may still have delivery, temperature. and humidity issues. *Jerry*

Weak Hive

Q – *I have a hive with only two frames of bees with scattered brood. I can't find a queen. Should I requeen or add frames to another hive? Thank you. Mr Johnson*

A – Probably time to combine this with a strong colony. Winter is coming and two frames is not enough of a good start. *Jerry*

Oxalic Acid Vapor Treatment

Q – *Jerry, my first question I would like to ask is about an oxalic dribble/drizzle. I understand that that is not effective when brood is present. You referred to damaging the bees/colony.*

What are your thoughts on doing a treatment around the end of December when little or no brood is present in my location? Thanks, Eddie

A – Northern European beekeepers have been using one treatment oxalic acid 'trickling/dribbling for a long time successfully by application when there is little or no brood present. That means most of *Varroa* is exposed and one treatment means the bees and the Queen experience less collateral damage from the Acid. Vaporization can be used but please only once as there is more collateral damage to the colony with multiple vaporization applications. Dribbling is cheaper and easier. *Jerry*

Eddie, thanks for the quick response. We have some members of

From The Editor –

our club who do an oxalic vapor treatment every week for three or four weeks during the Summer. I can't believe that the queen is not damaged by this. Eddie

Jerry, let's say you have a parasite on you the size of a rat Eddie. You can't get it off and I can't help you get it off either. So we come up with a plan. I'll lock you in your closet and we will vaporize a caustic acid in the closet with you. We do it. I open the door and the parasite the size of a rat has fallen off. Good deal. But you have burns on your skin, you nasal passages are burned along with your trachea from breathing this stuff in. Some of your eyebrow hairs are burned off and your eyes are red and watering because of acid burn.

This is what is happening to a colony of honey bees with multiple applications of Oxalic Acid. Workers may only have a short life span but the Queen gets hit every time. Honey Bees communicate with a variety of pheromones, kairomone odors. The honey bees nose is at the tip of their antenna. With multiple Oxalic Acid vaporizations these get burned and the bees can't smell. They can't communicate and that is why there is Queen supercedure so often because the bees can't smell if there is a Queen or brood or danger or . . .

And Oxalic Acid when it comes in contact with Calcium cause it to leach out. That is why humans who are exposed to Oxalic Acid sometimes get kidney stones. Honey bee larvae have lots of calcium in them as well as adult honey bees.

It just isn't a good idea. And when the colony dies over winter the beekeeper blames something or somebody else.

I am stepping away from the microphone now:) *Jerry*

Replacing Old Comb

Q — *I lost all nine hives, primarily due to "Covid neglect"* – Varroa *and starvation, not disease. I am making lemonade from these sour lemons, taking advantage of emptied equipment to clean, repair, paint, etc. It seems like a good idea to get* on *board with the three to five year comb replacement plan as well. Do I clean the wooden frames and scrape off the old wax off the plastic foundation, replace the plastic foundation in the current frames, or scrap the whole thing and start new? If one of the latter two, what do I do with all that plastic?! Catherine*

A — It's humbling isn't it? Which in 2021 isn't a bad thing for all of us.

In old brood comb the residue of chemicals, bacteria, virus and combinations thereof are in the dark brood comb. The 'dark' is a buildup of larval skins as the developing larva molts many times and those that follow in the same cell. The darker the more larval skins, the more potential 'residues' are there

If you have embossed plastic foundation scrape off all the old comb the best you can. And scrape any thing off the wooden frame as well. If you have access to CLEAN beeswax you can melt it in a double boiler and using a paint brush or one of those small paint rollers recoat the foundation. It encourages the bees to build more comb but it also covers over any old comb residue you couldn't scrape off.

It should be fine. And if you take out two combs every year and do the re-work you stay ahead of the game and not all at once.

Please go to the Honey Bee Health Coalition, 'Tools for *Varroa* Management Guide', memorize it and pick out your control options and do it. **https://honeybeehealthcoalition.org/wp-content/uploads/2015/08/HBHC-Guide_Varroa-Interactive-PDF.pdf.** *Jerry*

When Do Swarms Start

Q — *Hi Jerry, I miss not having you doing "The Classroom." Happily, Jamie Ellis is doing a good job. I suppose because you taught him everything he knows about beekeeping. :)*

Although you are no longer doing "The Classroom" for the American Bee Journal*, I have a question that perhaps you are the one to answer. Some years ago I read in the* ABJ *that one could expect the swarming season to start a certain number of days (or was it weeks?) after dandelions started to bloom. However, I don't remember just how many days it was that you (if it was you) said. Could you please enlighten me as to how long the time is?*

Regarding another issue, I once asked you whether to use two-pound packages or three-pound packages. You answered that one should use three-pound packages. In the back of my mind I thought I had once read something different. Recently I was rereading an old article "Productive Management of Honey-Bee Colonies" by C.L. Farrar which was published in the ABJ, Vol, 108, Nos.3-10, 1968. I quote from the article, "The two-pound package supporting a good queen will develop a full strength colony in practically the same time as a larger package when drawn combs, pollen, and honey can be supplied." I suppose I didn't make it clear that I was able to install my packages into hives that I now know satisfy Farrar's conditions. In my case, a local commercial beekeeper sold me some two-pound packages for a price I couldn't turn down.

I want you to know that after my best friend and mentor Dave Noetzel passed away, I turned to you for beekeeping information. I greatly appreciate your help. Thank you so much. God bless you, Joe Schultz

A — Nice to hear from you and for the compliment. Jamie is a lot smarter than I am:)

Nothing in Beekeeping is solid to hang on to. Certainly generalities but in the age of *Varroa*, all generalities are false. If somebody said that it was X days after dandelions bloom that swarms emerge that is highly variable and not true. When Spring in general starts then of course nectar and pollen and weather interact to encourage colonies to grow and prepare to spread their genetics (swarming) while they in parallel prepare for winter. And these all have different calendar dates depending if you are in Georgia or Minnesota or Arizona or Idaho. Honey Bees are always preparing for a temperate Winter.

The key is not just dandelions, its all early pollinator friendly flowers along with day length, temperature, pollen and nectar from any source in amounts that encourage brood rearing.

I still vote for a three-lb package if the price is right and the package has lots of young bees. Simply because in Spring more bees are better than fewer bees for brood rearing, internal temperature control, foraging for pollen and nectar, etc. Of course, a two-lb Package will work it just takes X time longer. All the best to you. Stay safe and well. *Jerry*

It's Summers Time –

Fall and Goldenrod and Dahlias

Well there are some clear signs here in Northeast Ohio that Summer is almost done. The lady who sells the best sweet corn in this area is no longer at that corner gas station right on the way home from work. Her corn is the best but she also has melons, tomatoes, cucumbers – lots of fresh fruit and vegetables. We watch for her to appear late June/early July and then we're sad when the end of September comes and one day she's just not there.

Another sure sign is the goldenrod crop and it seems to be extremely abundant this year. It's such a mixed blessing – we long for the good honey crop, but we know it means that Summer is pretty much over. You can see in the photo that our lucky bees just have to 'step' out the front and there it is. I got my first whiff of it as I was mowing past the hives last week. If you've never smelled goldenrod while the bees are processing it you might not realize that the smell can actually be a bit offensive until you know what it is. We've had phone calls in past years from folks saying there's something terribly wrong with my bees. Then once we realize what it is Kim will say 'that's the smell of money.' It's in high demand in our part of the world.

We're nearing the end of the garden season. We had a pretty good tomato and pepper crop this season. I made stuffed peppers and had enough to freeze and share. Kim and I are still adjusting to our raised beds and learned a few more lessons this year. Tomatoes and basil are frozen for some wonderful soup this Winter.

Our property is always a work in progress. It's ever changing and being redefined. Kim, along with help from one of our spare children, probably planted 40 more trees this year. Thank you Matt. We lose a few and we plant a lot more.

The poultry gang is doing well. We haven't lost anyone this Summer – 14 chickens, four ducks. I think there are three or four from our original group which would make them about eight years old. Welfare chickens we call them. But that's okay, they're just fun to be around.

We got to do something new and fun this past weekend. Our dear friend Nancy is a Dahlia expert. She belongs to the Dahlia society and grows amazing flowers. Well, they have an annual regional show and she asked Kim to help judge the photography portion. So off we went to Wooster early Saturday morning, properly masked because it was part of the Ohio State campus and helped judge photography. It was amazing. Dahlias come in every shape and size.

Kim next to one of the biggest flowers I've ever seen. Below one of the many displays of different dahlias. There must have been thousands. And at the bottom, Nancy won a ribbon for her arrangement.

The printing and publishing and mailing businesses are still somewhat bumpy. Across the board you probably didn't get your September issue as early as you normally would. That was due in part to our amazing printer being short-staffed like so many of us. You probably didn't get this one as early as you hoped either.

Please know that all of us are doing are very best, but sometimes we fall short on almost every level. There are still so many things we can't control. And even the ones we think we control don't always happen like we plan.

I hope you have enjoyed your Summer and that you have a peaceful, mild Fall and Winter. Take care, be safe.

Hardy Summers

NEXT MONTH

Region 1
- Provide Top Ventilation/Upper entrance
- Install Mouse Guards
- Provide a wind break
- Put Insulated Covers on
- Sell Honey $$$
- Check Colonies for 50+ lbs. of stored food
- Wrap Colonies
- Inventory woodenware for Winter assembly
- Feed if needed
- Sleep in
- Check Bear Fence

Region 2
- Feed if necessary to get weight up
- Sample and Treat for Mites/Too Early for Oxalic
- Consolidate Hives
- Make Christmas List full of Beekeeping Supplies
- Harvest Skunks
- Final Emergency Feeding
- Combine Weak Colonies
- Reduce entrances

Region 3
- Feed if necessary
- Repair Equipment
- Survey for mites, treat if necessary
- Combine weak colonies
- Put mouse guards on
- Cross your fingers

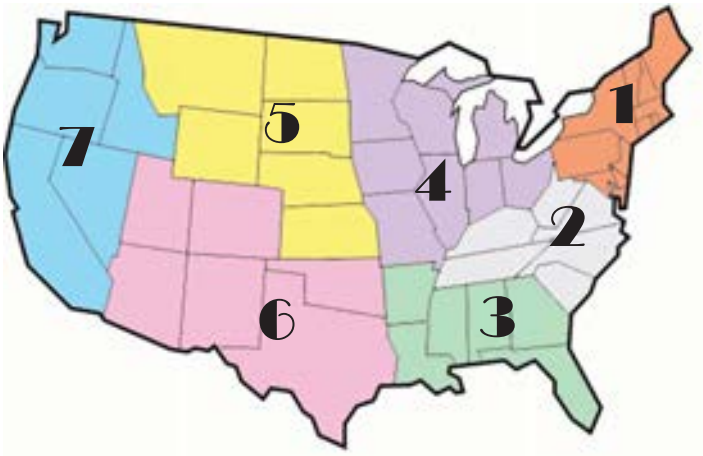
Region 4
- Leave minimum of 50 lbs. of Honey on colonies
- Mite treatment should have been done already
- Winter Wrap Hives
- Install Windbreaks
- Feed if needed
- Replace inner cover with 1" insulated 'Pink' Board
- Send bees to California
- Prep colonies for trip west

Region 5
- Feed and Wrap
- Ship to Warmer Climate
- Take a Vacation
- Move to Indoor Wintering
- Make sure they have plenty of winter stores
- U.S. Honey prices are Skyrocketing

Region 6
- Sample for *Varroa*, three or more per hundred – treat
- Check Stored Honey weight
- Check Strength of colonies
- Combine weak colonies
- Wrap colonies in higher elevations

Region 7
- Check Colony Weight
- Wrap Colonies
- Provide an Upper Entrance
- Monitor in hive moisture, vent as needed
- Take them south to get ready for Almond pollination
- Do Book Keeping

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 **Kathy@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.



OCTOBER – REGIONAL HONEY PRICE REPORT

	REPORTING REGIONS							SUMMARY			History	
	1	2	3	4	5	6	7				Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS								Range	Avg.	$/lb		
55 Gal. Drum, Light	2.29	2.28	2.35	2.33	2.51	2.15	2.00	1.89 -2.95	2.31	2.31	2.20	2.18
55 Gal. Drum, Ambr	2.21	2.20	2.13	2.31	2.50	2.05	1.85	1.74-2.75	2.21	2.21	2.03	2.02
60# Light (retail)	222.27	191.67	215.00	174.13	195.00	184.12	197.33	120.00-300.00	200.78	3.35	197.62	206.28
60# Amber (retail)	215.00	188.33	215.00	169.96	220.00	182.09	206.10	120.00 -285.00	198.47	3.31	197.19	200.40
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	105.64	76.50	96.00	76.67	112.80	114.87	114.87	66.00-194.40	99.53	8.29	89.37	97.76
1# 24/case	167.02	135.60	137.20	112.22	160.80	95.92	144.00	48.00-300.00	143.18	5.97	131.19	129.58
2# 12/case	147.73	109.42	129.40	105.07	76.12	102.00	132.00	40.40-246.00	127.37	5.31	121.38	111.50
12.oz. Plas. 24/cs	130.54	143.36	106.67	115.53	69.30	101.88	114.00	54.84-305.98	119.43	6.64	104.27	98.17
5# 6/case	166.46	116.30	156.73	130.81	113.16	120.00	156.73	90.00-240.00	148.46	4.95	133.84	134.07
Quarts 12/case	190.24	186.09	135.33	132.42	157.37	119.88	229.50	109.20-360.00	173.15	4.81	154.65	157.41
Pints 12/case	129.59	111.92	80.33	83.21	85.03	80.00	104.00	60.00-240.00	101.62	5.65	97.81	98.99
RETAIL SHELF PRICES												
1/2#	5.73	6.20	4.85	5.21	5.34	2.98	5.75	2.98-9.00	5.50	11.00	5.48	4.95
12 oz. Plastic	7.00	7.65	6.03	5.88	4.60	5.63	6.20	2.89-11.00	6.38	8.51	6.94	6.23
1# Glass/Plastic	9.08	9.10	8.22	7.04	7.31	7.20	10.00	4.79-17.00	8.46	8.46	8.65	7.69
2# Glass/Plastic	14.97	14.03	15.44	12.05	11.38	10.70	15.50	6.39-25.00	14.17	7.08	15.78	13.04
Pint	12.41	12.64	8.48	11.44	9.60	11.80	11.30	6.65-22.00	11.39	7.59	10.94	11.40
Quart	21.34	20.62	16.00	15.59	16.81	17.33	21.44	9.25-42.00	18.83	6.28	18.75	18.73
5# Glass/Plastic	33.47	31.55	45.00	28.33	28.27	21.00	50.00	17.00-55.00	32.30	6.46	30.50	27.17
1# Cream	10.65	8.95	10.50	9.76	9.25	10.00	13.50	6.71-18.00	10.41	10.41	10.10	9.66
1# Cut Comb	13.88	13.38	10.00	13.22	11.50	12.00	12.00	8.00-24.00	13.15	13.15	13.97	12.70
Ross Round	10.64	7.58	12.04	14.25	12.00	12.04	13.75	7.00-19.00	11.07	14.76	10.98	10.54
Wholesale Wax (Lt)	8.45	5.85	6.38	6.57	6.38	4.00	8.40	3.00-15.00	7.17	-	7.21	6.46
Wholesale Wax (Dk)	7.44	5.32	5.75	5.00	6.50	2.88	10.00	2.00-15.00	6.33	-	6.21	5.06
Pollination Fee/Col.	80.83	75.00	158.33	100.00	200.00	123.12	71.00	50.00-300.00	93.24	-	93.10	84.96

Emergency Assistance Available For Beekeepers

Overview – The Agriculture Improvement Act of 2018 (the 2018 Farm Bill) authorized the use of Commodity Credit Corporation (CCC) funds for the Emergency Assistance for Livestock, Honeybees and Farm-Raised Fish Program (ELAP). ELAP provides financial assistance to eligible producers of livestock, honey bees and farm-raised fish for losses due to disease, certain adverse weather events or loss conditions, including blizzards and wildfires, as determined by the Secretary. ELAP assistance is provided for losses not covered by other disaster assistance programs authorized by the 2014 Farm Bill, such as losses not covered by the Livestock Forage Disaster Program (LFP) and the Livestock Indemnity Program (LIP).

Eligibility Requirements and Payment Calculations – For additional information regarding eligibility requirements and payment calculations for a specific type of livestock, honey bee and/or farm-raised fish loss, see the ELAP - Farm-Raised Fish Assistance, ELAP - Honey bee Assistance or ELAP – Livestock Assistance fact sheet at fsa.usda.gov/ELAP.

How it Works – Applying for Assistance Producers can apply to receive ELAP assistance at local FSA service centers. The ELAP application period ends Dec. 31 of each calendar year. In addition to submitting an application for payment, producers who suffered losses must submit a notice of loss to the local FSA service center that maintains the farm records for their business.

More Information – This fact sheet is for informational purposes only; other restrictions may apply. For more information about ELAP, visit fsa.usda.gov/ELAP or contact your local FSA office. To find your local FSA office, visit farmers.gov.

Imported Honey Totals 2020/2021

Imported honey for 2020 as of the end of September, and for 2021 as of the end of July. Some 2020 reports were not published. 2021 is already 9.3 million pounds above 2020.

U.S. Imported Honeys

	Sept. 2020 kg	July 2021 kg
Organic	2,944,168	3,911,194
ELA	4,674,426	7,573,474
White	2,054,028	2,364890
Retail	414,242	406,740
LA	6,274,537	6,572.541
Amber	1,197,018	957,825
KG Totals	**17,578,419**	**21,804,064**
LB. Totals	**38,760,413**	**48,077,961**

Technology Tips For Beekeepers

Malcolm T. Sanford

COLONY MONITORING USING THERMAL IMAGING

Scott Debnam; University of Montana; USA: Scott.Debnam@umontana.edu

Honey bee colonies are superorganisms that display parental care behaviors at the colony level. This behavior includes feeding and protecting the brood, as well as temperature and humidity regulation. It is the responsibility of the youngest adult bees to provide parental care. This subset of the colony has been identified as nurse bees. Within this subset of bees, there are further labor divisions such that there are members of the nurse bees who are specifically engaged in maintaining brood temperatures. These specialized nurse bees are known as heater bees. When conducting their heating behaviors, they are indistinguishable from the other nurse bees in the colony. I utilized thermal imaging to identify the heater bees in research observation hives. The thermal camera provided detailed information about thoracic temperatures that allowed for easy identification and quantification of the heater bees and their behavior. I then utilized thermal imaging to quantify brood temperatures by the developmental stage. Thermal imaging technology allowed me to determine brood nest temperatures down to the per-cell level. Analysis of the thermal images revealed that brood care is conducted at the per-cell level. This individual level of parental care results in a wide range of temperatures within the brood nest, all regulated by the particular brood's needs in each cell. 14 minutes, https://tinyurl.com/23jepxtv

BEEHEROX; Huw Evans; BeeHero; huw@beehero.io

Innovative beehive monitoring technology establishes itself as the most necessary instrument for beekeeping, bee research, and Precision Agriculture. BeeHero's subsidiary: BeeHero X, presents three further potential applications of this technology. Two of those applications are based on bioacoustics and the experience gained over the last decade monitoring the beehive sounds. One such project has led to the development of an Asian hornet (Vespa velutina) recognition system.The system developed has been tested and proven in Italy and Belgium, which has given the impetus for BeeHero's initiative to apply this methodology to detect the newly reported Asian Giant Hornet (Vespa mandarinia) in the US. The second bioacoustics application is remote sensing of pollinators' abundance and richness. In-field sensors are placed in the crop to detect the presence of pollinators distinguishing among the different species (richness) as well as logging the abundance of each species. The applications of this tool range from precise modeling of pollination right through to conservation. The research behind providing precession pollination as a service has resulted in the development of tools and methods that are not commonplace in apiculture due to their complexity and cost. Over three growing seasons, we have deployed hive monitoring technology during almond pollination in California. We have been able to precisely monitor the changes in bee activity related to the application of fungicides, varying climatic factors, and insights into the apparently non-linear nature of the strong colonies' productivity compared to weaker. 15 minutes, https://tinyurl.com/68bxvaak

BEE HEALTH GURU NSF I-CORPS NATIONAL TEAM

David Firth; University of Montana; USA; david.firth@mso.umt.edu

The Bee Health Guru smartphone app listens to bees and identifies colony health problems. This technology received an NSF I-Corps award. I-Corps uses experiential education to help researchers gain valuable insight into entrepreneurship, business startup, industry requirements, and challenges. It makes you talk to potential customers, without talking about your technology, to test hypotheses about what customers want and need. We thought that Bee Health Guru would be perfect for backyard beekeepers to see if their bees were healthy. We quickly learned that most preferred to check on their bees' health themselves. The only market for a bee health detector for this group was newbie beekeepers, a small, constantly changing market.

https://beekeep.info/vita_details/

We had also thought that our health monitor would be great for commercial beekeepers, allowing them to reduce costs by having fewer employees. Instead, we found that many commercial operations want to keep all their employees, who are hard to train, and they need those employees to take care of the bees. In an unexpected development, we found that the best customer for our bee health monitoring technology was a new type of beekeeper – professionals who place bees at hotels and other corporate locations so that those companies can say how they are helping the environment and being "socially responsible." These beekeepers found a lot of value in a technology that can monitor bees and their health remotely and allow the professional beekeeper to only go to the location (hotel, airport, etc.) when they need to.19 minutes, https://tinyurl.com/2x9sketd

New Books For That Fall Reading –

Honey Tasting Journal. Produced by the American Honey Tasting Society. $20.00. Soft cover, color covers, black and white inside.

The American Honey Tasting Society has come out with a Honey Tasting Journal that's used to keep records of the components of each honey sample you taste, so your records are consistent and easy to compare. It's a comfortable-to-use 5" x 7", with 100 pages used to take and record notes for each honey sample you taste. Each page has a section to enter a honey's components including origin, visual aspects, notes on aroma, flavor and texture. There's also a list of possible defects the sample may have had. The inside front cover has good instructions on evaluating each of these components.

The inside back cover has a very detailed honey and aroma chart covering the flavors including fruit, a decidedly interesting flavor called warm, then fresh, vegetal, animal, woody, chemical and spoiled. It is, essentially, the Honey Tasting Wheel redrawn to fit a rectangle page.

On the back cover is the honey color palette, identifying 30 individual colors you can assign to the honey sample you are tasting.

This Honey Tasting Journal is a must have for beekeepers and honey tasters who want to keep good, consistent records. Wholesale inquiries welcome! Bee clubs welcome! International shipping available! Email: **AHTS.USA@gmail.com**. Individual purchases of this Journal can be made at **https://www.americanhoneytastingsociety.com/product-page/honey-tasting-journal**

Kim Flottum
Growing Planet Media

The Lockdown Pallet Hive. Jonathan Powel. Published by Northern Bee Books. ISBN 978-1-914934=14-8. 6.5" x 9", soft cover, color throughout, 20 pgs., $14.87.

The Lockdown part of this title is a result of what the author had to do while producing this book during the covid pandemic in the UK. His original intent was to simply show how to build this unique hive using parts of two wooden pallets.

The pallet hive is designed to replicate a honey bee nesting cavity in a tree. It is tall, narrow, has rough, thick insulating walls and a permanent top and bottom fastened with bolts, with the top covered in rubber for weathering. The cavity is shaped as an octagon. There is some flexibility built into the design to accommodate different pallet dimensions, and these are pointed out in the directions.

There are good photos for every step of the construction, and the written instructions are easily followed if you have basic woodworking skills and tools. When complete the pallet hive can be attached to a tree as high as reasonable, but consider having to remove to repair or replace it. Support can be provided by existing branches or ratchet straps and be used around the hive and the tree trunk providing the tree is protected from them cutting into the bark.

The author is a trustee of the Natural Bee Keeping Trust and a trained Zeidler tree beekeeper. He says, "This hive is not for honey harvest – it's for the bees and our joint future together". That's a pretty admirable attitude I think.

Kim Flottum
Growing Planet Media

Beyond Honey. Tierney Monahan. Published by New Degree Press. ISBN 978-1-63730=451-8. Paper back. 8.5" x 11", 104 pgs. $15.99.

This book will not teach you how to keep bees in a new, different or natural way. It is not a how-to book. Rather, it focuses on how you and I share the world we live in with honey bees. It has three sections explaining how this works.

Section one examines our common home, and looks at bees as teachers, shares a bit of bee biology and what we have in common, and what we don't have in common. It also examines the problems bees are having – and how we are interdependent, we provide forage, they provide pollination. It looks at the issues of climate change, pesticides, the pest and pathogens bees suffer from and that the world does not need more honey, rather more people to look out for the bees.

And then comes part two. This examines in some detail how bees are helping us in other ways. The many programs of teaching people in prison about bees and how to keep them so they have something to do when they are released. There are several programs examined here. Of course there are inner urban areas that bees can be kept in, and one company making and selling honey bee derived products to inner city beekeepers. The difference is that those doing the making and selling are on the edge, and this opportunity gives them an employment history and a skill set to use later, along with skills in working together and commitment.

Part three looks at the rest of the world and how it is working with bees. The UN has a honey bee program, and from the UK, Bees For Development is working around the globe with people, training to become beekeepers, finding dollars for donated equipment, teaching locals peoples to better support their families, without having to have land or lots of money. And then there are the Bee Cities, and Bee Campuses, which work with honey bees, and local, native bees, providing safety, habitat and forage.

There are more ways that bees and people share the world discussed here. But the value of this book is that you can now share even more with the people you know, the community you live in and the planet we inhabit. This isn't a book about beekeeping, it's a book about why we should be keeping bees.

Kim Flottum
Growing Planet Media

Crop Pollination by Bees, Vol. 1., Evolution, Ecology, Conservation and Management. 2nd Edition. Keith Delaplane. Published by CABI International, Wallingford, UK. ISBN 9781766393494. Soft cover, 174 pgs., 7.5" x 9.5", color throughout. $67.50. This is an update to the Edition published in 2000, with Dan Mayer.

Dr. Delaplane has updated the insect pollination work he and Dr. Dan Mayer did just over two decades ago. This is, without doubt, a very comprehensive and detailed look at, essentially, the entire aspect of the relationship between bees and plants. All of the bees, and all of the plants that bees pollinate. Moreover, it brings into play the role that humans play in this seed and food producing activity.

There are 11 chapters in this text book for both scientists and the rest of us, with a large selection of photos and drawings of bees, flowers, equipment and more to illustrate the content of each chapter. There are also many charts and graphs that detail what may appear to be very different aspects of these diverse individuals together.

Evolution of both plants and bees is explained and described, as is the basic biology of bees. And that would be all of the bees that are involved in the world of pollinating plants. Eleven families of bees are examined, showing both physical and nesting behaviors and how they play a role in, and what flowers they pollinate. Just over 70 species of crop plants have their flowering systems examined and what kind of pollination they need along with their dependance on the pollinators used. This gives good background with working with growers and understanding how a crop is produced.

Following this are estimates of the value of pollinators for various crops on a global scale. What insects for what crops in what country, summed up nicely. This is followed by estimates of the global bee population changes occurring over time, and the reasons for those changes. Some declining, some not changing, some increasing, which includes a quick look at restoring bee habitats.

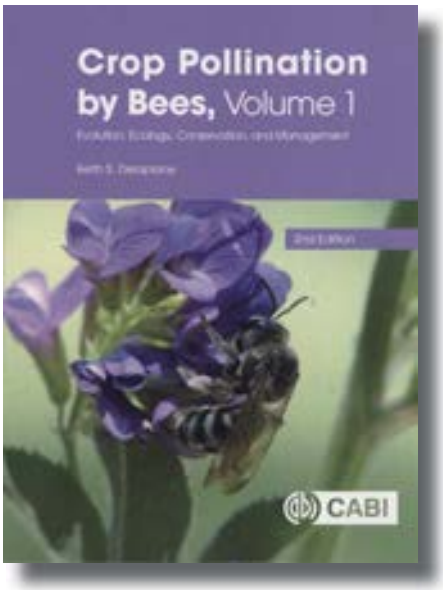
There is an excellent 20 page section on managing honey bees for pollination, including global numbers of managed colonies for the 20 most populous countries. The US is number 10 on this list. India is number one with 13.04 million colonies, US has 2.8 million colonies and number 20 is Serbia with 0.9 million colonies. The remainder of this chapter covers the beekeeping basics that commercial pollinators will find useful that includes moving hives, timing, spacing, and competing bloom, among other topics.

Then there is a long, close look at managing bumblebees, including biology, queen breeding, raising colonies and using them for pollination. This is followed by looking at managed solitary bees (think alfalfa leaf cutters), but also Alkalis and orchard masons, too.

The author finishes with chapters on using wild bees and stingless bees in an operation and what would be needed for habitat and protection.

If you are already a commercial pollinator, want to become one, or simply want to know much more about the art, science and business of pollination with bees, this book should be on your shelf, within easy reach.

Kim Flottum
Growing Planet Media



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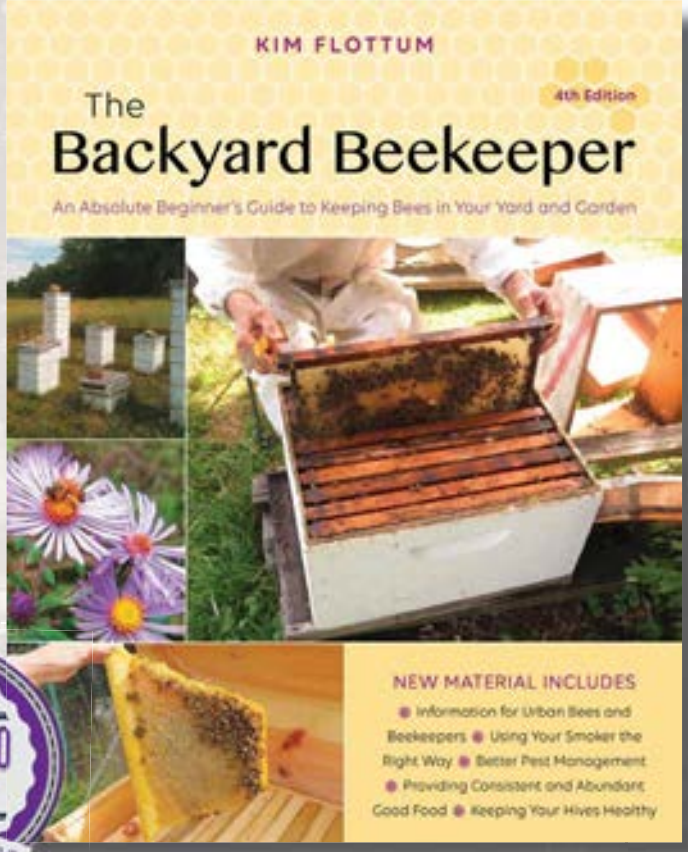
- SWARM CONTROL
- USING TOP BAR HIVES
- HARVESTING THE PRODUCTS OF A BEEHIVE AND COLLECTING AND USING HONEY
- BEE PROBLEMS AND TREATMENTS



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FOUND IN TRANSLATION

Food And The Thinking Bee

Jay **Evans**, USDA Beltsville Bee Lab

Honey bee foragers get cues from dancing nestmates, colony stores, and the gaping mouths of thousands of developing larvae as they make foraging decisions. But while these social cues give foragers some incentive and a bit of a compass, the true roadmaps for their trips are more solitary. A bee leaving the hive with a vague trajectory relies on immediate cues such as landmarks, colors and scents (flowers are not spending their energy making fragrances for our sake!) to both find resources and make it back home. Bees do not forage in packs, so many of these refinements of foraging once a bee leaves the hive reflect individual decisions and individual acts. What makes a good forager good? And what is the bee thought process while they are on the wing?

Not surprisingly to those who study bees as beekeepers or scientists, bees get better at foraging as they mature. Simon Klein and colleagues tracked individual foragers to determine their foraging efficiency in their paper "Honey bees increase their foraging performance and frequency of pollen trips through experience, 2019, *Scientific Reports* Vol. 9 Issue 1, **DOI: 10.1038/s41598-019-42677-x**). Using hive-level monitors, they measured net foraging trips (average per bee was 19 trips across four or five days before they disappeared) as well as the weights and cargo of each bee as she left and returned, giving a precise measurement of nectar and pollen returns. About one quarter of the bees in the two study colonies collected pollen on at least one outing, and all of these bees also collected nectar or water at some point. As has been shown before, the colonies held a set of 'elite' foragers which both foraged for more days (more than twice as many as the average) and came back with food more times each day. Elite bees shared the nest with a larger set of low-impact foragers that dragged down the longevity and profitability averages significantly. The authors did not measure traits that separate these two classes but speculate that stressors such as pesticides and disease, along with genetics, might have led some bees to under-perform. It is of course likely that bad luck plays a part as well, even would-be 'elites' might have been picked off early by a wasp, bird, or lawnmower.

Photo by Peggy Greb.

Getting back to bee learning, foragers in this study had greater success as they aged in terms of both trips-per-day and net weight gain on those trips, up until around their 9th day of foraging. These data are largely based on elites but when individual bees were tracked both elite and underperforming bees did a bit better in successive trips. Are they remembering good spots, more fit as fliers, or simply getting better at receiving cues before or after leaving the hive? Researchers have spent several decades teasing apart decision making by foraging bees, largely in honey bees and bumble bees. For bumble bees, one strong paper from 2011 by Mathieu Lihoreau and colleagues helped map the decision making of these bees as they set a course for different flowers ("Trade-off between travel distance and prioritization of high-reward sites in traplining bumblebees", Functional Ecology 2011, 25, 1284–1292 **doi: 10.1111/j.1365-2435.2011.01881.x**). In a simplified environment (only five artificial flowers in total), bees foraged in a way that minimized the net time spent on the wing ('traplining'). However, if one of these flowers was made to give a higher reward by increasing the sucrose concentration, bees shifted their foraging toward collecting the best food first while still trying to limit overall flight distances. These subtleties were retained for trip after

trip, suggesting bees have a fine-scale memory down, in this case, to the level of individual flowers. This is certainly enough thinking for a honey bee or bumble bee arriving at a garden to target the plants most likely to give a quick reward.

In August, I wrote about the abilities of bees to ignore certain cues in their environments while focusing on those cues that were most relevant for their lives (work by Chelsea Cook **https://scholar.google.com/citations?user=lGDvqJ8AAAAJ&hl=en**, and others). Those studies showed that some bees, like some humans, are more likely to stay on task in a complex world. One of the environmental cues used to identify discriminating bees in this study was the presence of a particular smell. A recent study looks at the interplay between visual and olfactory (smell-based) cues a bee receives as she flies to food sources. This study, by Lisa Evans (no relation here) and colleagues, was published in *Frontiers in Ecology and* Evolution, in July, 2021, **doi: 10.3389/fevo.2021.676289** ("Odour learning bees have longer foraging careers than non-learners in a natural environment"). Their goal was to see whether bees that were good at connecting particular smells to a food reward (sucrose was on the menu again) were also good foragers. The test the bees were given was to associate the smell of lemon oil (chosen because lemons were not part of the local landscape) with a

sugar reward. Three-quarters of all tested bees passed this learning test while one quarter did not. As with 'elite' honey bees, bees that were learners ended up being better lifetime foragers. However, after a lifetime of measured foraging (80 bees in total), it did not seem to matter how accurately bees learned to associate the lemon smell with food, just that they could do so at all. This harkens back to some of the under-performing honey bees, which might be in that state because of disease or stress. Whatever the root causes of slow-to-learn bees, they seemed to be somewhat universal in that each of the five measured colonies had non-learners that ended up being poor foragers.

While these studies indicate the power of the individual in achieving a lifetime of bringing home the goods, what is fascinating for honey bees, of course, is that they make these individual decisions outside of the box after getting many insights from inside the box, before they leave home. With new techniques to observe bees inside their colonies and then follow them as they venture out, it will be fascinating to see how group and individual cues weigh on the minds of foraging bees. May you all learn some cues and lead happy productive lives inside and out. BC

A True Beekeeping Ghost Story

Stephen **Bishop**

One Saturday morning, my wife's second cousin, Katie, came pedaling up the road. She veered into our driveway and then dismounted her moving bicycle, which careened to a temporary resting place. After partly catching her breath, the girl spoke between short inhales and announced her purpose – she always had a purpose, a mission, a call to action. She said directly, in no uncertain terms, "I need two pumpkins for carving."

The hay wagon in our front yard was covered with mismatch collection of pumpkins – round, oblong, warty, giant, miniature, orange, white, pie, jack-o-lantern. I had grown these pumpkins in a half-acre pumpkin patch, a small battlefield where vine borers and squash bugs took up arms and joined forces with downy mildew to destroy as much vegetation as possible. The surviving pumpkins were on that wagon; part of my soul was on that wagon. I had to ensure my pumpkins would be well-taken care of and asked, "How are you going to carry two pumpkins on a bike?"

Katie had a plan. Katie always had a plan. She would identify two pumpkins that met her standards and specifications, put them on layaway, and retrieve them before she went to the Bar-H Haunted Hayride, where the ghosts were only moderately spooky, according to her friend Julia. Julia had been on a hayride before and was going again with Katie tonight. Katie's grandma, Nell, who was our closest neighbor, would chaperon the two young girls. Katie gave strict orders: nobody was to steal her two chosen pumpkins.

"Sure thing," I said, "but there's no need to go to the Bar-H to find ghosts. Two real ghosts live on this farm."

"Don't listen to him. Ghosts aren't real," said my wife, Natalie.

Like Katie, my wife was a Kendrick. Kendricks are infuriating people who add disclaimers to perfectly good ghost stories. For a Kendrick, any story involving disembodied voices or footless footsteps is worth telling, albeit with the clause "but ghosts aren't real" or its equivalent attached. Why anyone would tell a story they don't believe in, qualify it with an easily overlooked footnote, and run the risk of propagating lies and mistruths is beyond me. But that's what my in-laws do. Personally, I've made it a point of principle to only tell true ghost stories, like this one, and set a good example for my in-laws. But, in response to Natalie, Katie quickly affirmed her Kendrick lineage, saying, "I know ghosts aren't real. Those people at the hayride are just putting on."

"If ghosts don't exist," I protested to my wife, "how come I saw your great grandma standing beside our bed on the very night you were dreaming about her? And how come you saw your Uncle Tom in the barn at the very spot he always hid his liquor bottle?"

"Don't be silly," Natalie said, "Great-grandma Kendrick died in the front yard in an ambulance. You'd be more likely to see her while cutting grass or checking the mailbox than sleeping – if ghosts are real."

"How do you explain Uncle Tom in the barn?"

"I was seeing things. The scariest thing in that barn is the skunk family living under the feed room." Days before, my wife had been chased by a momma skunk and three skunk pups through the cattle chute. Thankfully, the head-gate was open, or she would have met a dead and smelly end.

With her two pumpkins set aside, Katie pedaled off. With all the rain and wet conditions, it had been a bad year for pumpkins, but those rains supercharged the goldenrod with nectar, and that year the bees produced a fall rarity – a honey crop. Just on a flyer, I had put the honey supers on the hives, and, by George, if the bees didn't fill them with smelly goldenrod honey. It just goes to show you can't make a honey crop if you don't put the supers on. So that afternoon, I recruited Natalie to help me rob hives. Even with her help, it took all afternoon to remove the heavy supers. By the time we loaded the last honey super on the truck, we were both exhausted as we drove back to the barn to put some beekeeping equipment in a storage room. It was nearly dusk.

While at the barn, we saw headlights pull into the driveway at the house. A car parked beside the pumpkin

wagon. Katie and Julia exited the car with grandma Nell in tow.

"I stink and I'm a sweaty mess cause of this bee suit," Natalie said, "go talk to them while I finish here."

"Well, I stink too," I said, "why do I…"

"You're a boy. You always stink."

"Alright, but…"

"Just go."

I took off my bee suit and went. Thankfully, no one had stolen Katie's pumpkins since she said she had worried herself to death about pumpkin thieves. She was excited, nonetheless, about the Bar-H Haunted Hayride. Katie informed me that her grandma was less than thrilled (Nell nodded) but would tolerate the excursion. Katie informed me that her grandma's cat was missing and asked if I had seen it since the cat liked to visit our barn to catch mice. Katie informed me that she'd like to go look for the cat in our barn.

"Sure," I said, as Katie and Julia were halfway to the barn. I told Nell that the girls would be fine because Natalie was in there putting up supplies. A few moments later, the duo disappeared through the barn door. Nell and I talked about the missing cat.

"One day I'll have the mice under control," I promised. "I apologize for all the dead mice it leaves on your porch."

"You know, I've never seen her catch a mouse, but she must be good at it."

"Well, a blind cat could catch a mouse in our barn." I said.

Suddenly, amid our small talk, a chorus of screams erupted, and Nell and I looked toward the barn. We found the cat. It shot out from the barn door and leapt into an oak tree—milliseconds after a scream that sounded like my wife had just realized ghosts were actually real. We watched as a ghostly figure faded into the pasture. Cows galloped away from the apparition. Then the source of the other disembodied screams materialized, as Katie and Julia flapped out the front barndoor, as if they were about to take off and fly away. Finally, four skunks scurried into the woods out of a side stall, too scared to spray.

Eventually, after calming the girls, luring the cat down, and locating a bee suit roaming the pasture, I was able to piece together what happened.

Katie and Julia were scared senseless by a ghostly white figure with a veiled face walking toward them in the barn. Katie informed me that I was right: she didn't need to go on the Bar-H Haunted Hayride to find ghosts.

My wife said that while approaching the girls she was scared senseless by Nell's cat that leapt from the feed room, believing herself under attack from the skunks.

Nell's cat said it was scared senseless by the skunks while hunting for a mouse.

The skunks later confirmed that they were scared senseless by the ghost of Uncle Tom trying to hide his liquor bottle. But, being Kendrick skunks, they added the necessary disclaimer at the end, "but ghosts aren't real." BC

Stephen Bishop lives in Shelby, NC, on a haunted farm. You can see more of his work at misfitfarmer.com or follow him on twitter @themisfitfarmer.

A Closer Look

HONEY BEE NAVIGATION, LEARNING AND MEMORY

Clarence **Collison**

A Bee Has To Learn Color And Shape Of Flowers.

"Foraging is essential to a honey bee colony's survival. To forage successfully, a bee has to learn and remember not only the color and shape of flowers that contain nectar and pollen, but also how to get to them (Menzel et al. 1996; Collett et al. 2003). Since the species of flowers that are in bloom, say, in the morning are likely to be replaced by a different species at a different location in the afternoon, the bee needs, and has indeed evolved, an impressive ability to learn and memorize local features and routes, as well as the time of blooming, quickly and accurately. Thus, having found a nectar bearing flower at a particular time on a particular day, a forager can remember the task and the time at which it was completed, and visit the flower at the same place and time on the following day (von Frisch 1967; Lindauer 1960) (Zhang et al. 2006)."

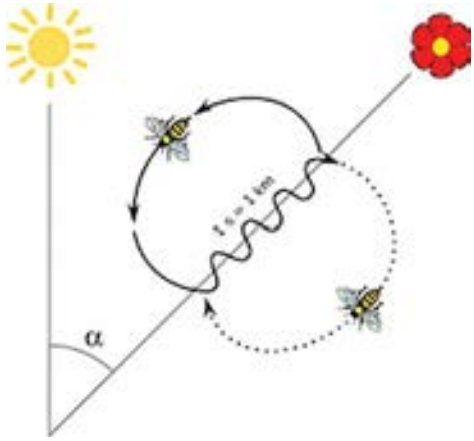
"Honey bees use visual attributes of the targeted food source, such as its color, shape, size, direction and distance from the hive, and the landmarks around it to navigate during foraging. They transmit the location information of the food source to other bees if it is highly rewarding. To investigate the relative importance of these attributes, Kheradmand et al. (2020) trained bees to feeders in two different experiments. In the first experiment, they asked whether bees prefer to land on (a) a similar feeder at a different distance on the same heading or on (b) a visually distinct feeder located at the exact same location. They found that, within a short foraging range, bees relied heavily on the color and the shape of the food source and to a lesser extent on its distance from the hive. In the second experiment, they asked if moving the main landmark or the feeder (visual target) influenced recruitment dancing for the feeder. They found that foragers took longer to land and danced fewer circuits when the location of the food source, or a major landmark associated with it, changed. These results demonstrate that prominent visual attributes of food sources and landmarks are evidently more reliable than distance information and that foraging bees heavily utilize these visual cues at the later stages of their journey."

"Honey bees were trained to fly from their hive to a feeding site along a flight path marked by visually discriminable landmarks 3.46 meters high. The landmarks were placed at regular intervals of 90 meters. During training, the feeder was located directly in front of the third (target) landmark. In the tests, bees were given the choice of landing at the trained distance or at the target landmark which had been displaced to a different distance. Bees preferred to land at the target landmark when the discrepancy between the two indicated distances was small, but landed mostly at the trained distance if the discrepancy was large. Furthermore, distance estimation depended on landmarks encountered during flight. When the target landmark was placed at a distance from the hive closer than the trained distance, the bees' readiness to respond to this landmark could be increased only if bees had already passed the landmark that preceded the target landmark during training. Thus, a given flight goal is defined in the bees' memory by its distance from the hive, landmarks that mark the goal, and landmarks that precede the goal during flight. At the same time, the bees, as a group, exhibited considerable flexibility to land in places that were defined by only one or two of the cues (Chittka et al. 1995)."

"In both their navigation and dance communication, bees are able to compensate for the sun's movement. When foragers are prevented from seeing the sun for two hours, they compensate by extrapolation, using the sun's rate of movement when last observed. These and other data suggest a time-averaging processing strategy in honey bee orientation (Gould 1980)."

"Foraging bees embark on their feeding flights and return to the hive using sun compass information (Wehner and Menzel 1990), and visual distance estimation (Esch and Burns 1996; Srinivasan et al. 1996; Menzel et al. 1996). These sources of information are tightly connected: compass directions are derived from extended landmarks (e.g. when bees fly along the edge of a forest) and home vectors are associated with local landmarks (Menzel et al. 1998), establishing a memory for the flight route between the hive and feeding site. It thus appears that spatial navigation in bees is not a unitary process but involves multiple navigational systems (Menzel et al. 2000)."

"Honey bees navigate using disparate (essentially different in kind; not allowing comparison) visual cues at different parts of their route. Upon exiting the hive, the bee has access to limited stimuli: landmarks around the hive and direction information from the e-vector. She can use these cues to travel in the correct direction. On her route, she can compare the real-time visual input of near and far-range landmarks to memories of points on the route on her previous trips and maintain her heading while keeping track of how far she has travelled. Once near her floral destination, she can use short-range landmarks to pinpoint her target (Collett et al. 2013). These navigational strategies broadly fall into three categories: alignment imaging matching, positional image matching, and path integration (Collett et al. 2013). At each part of the path, if the necessary visual information is available, bees can use it to navigate. Alignment image matching provides a simple way of comparing current views or cues extracted from a view with memories from previous trips. The animal then tries to maximize the match through corrective movements. If the bee is not too far from known areas where familiar features are abundant, this strategy allows her to stay on course. Positional image matching works by extrapolating the current location from differences between relationships among parts of the current view image and the same relationships in memories of views. The only requirement for positional image matching is that the panoramas (landscapes) of the novel area and the known areas share sufficient items in common. Alignment and positional image matching are not necessarily achieved in different ways, rather they are different scaling's of using memorized visual information to orient towards a goal. Path integration does not require landmarks, but only a source of the directional reference point (offered by the sun and its e-vector) and a source odometry (optic flow or stride counting). By keeping track of the path segments taken, the animal can ideally integrate its current location at any moment and find a homing vector (Collett et al. 2013). The relative accuracy of these three strategies depends on the situation. Path integration has a relatively low error at shorter distances and in novel areas but can result in larger errors when orienting near the goal because the remaining vector is much smaller than the accumulated error. Alignment image matching requires familiarity with the route but can guide the animal with minimal error and can be learned in a single trip. Landmarks clearly play key roles in alignment and positional image matching strategies but can also be combined with path integration to create short vectors for segments of the entire route (von Frisch 1967) (Kheradmand and Nieh 2019)."



"Free-flying bees were conditioned on a vertical wall to a vertical tactile pattern consisting of parallel lines of grooves and elevations. The asymptote of the learning curve is reached after approximately 25 rewards. Bees can discriminate the conditioned vertical pattern from a horizontal or diagonal alternative. Angle discrimination is apparent only for relatively coarse tactile cues. The proboscis extension response of fixed bees was used to condition bees to a vertical tactile pattern which was presented to the antennae. The learning curve reaches an asymptote after four rewards. After seven unrewarded extinction trials the conditioned responses are reduced to 50%. Bees show best discrimination for patterns whose edges they can scan with their antennae. The animals show a high degree of generalization by responding to an object irrespective of the trained pattern. Under laboratory conditions fixed bees can discriminate the angles and spatial wavelengths of fine tactile patterns consisting of parallel grooves. Bees can also discriminate forms and sizes of tactile patterns. They do not discriminate between different types of edges and between positive and negative forms (Erber et al. 1998)."

"Searching for reward motivates and drives foraging behavior. In honey bees, specialized pollen foragers are attracted to and learn odors with pollen. However, the role of pollen as a reward remains poorly understood. Unlike nectar, pollen is not ingested during collection. Nery et al. (2020) hypothesized that pollen (but not nectar) foragers could learn pollen by sole antennal or tarsal stimulation. Then, they tested how pairing of pollen (either hand- or bee collected) and a neutral odor during a pre-conditioning affects performance of both pollen and nectar foragers during the classical conditioning of the proboscis extension response. Secondly, they tested whether nectar and pollen foragers perceive the simultaneous presentation of pollen (on the tarsi) and sugar (on the antennae) as a better reinforcement than sucrose alone. Finally, they searched for differences in learning of the pollen and nectar foragers when they were prevented ingesting the reward during the conditioning. Differences in pollen-reinforced learning correlate with division of labor between pollen and nectar foragers. Results show that pollen foragers performed better than nectar foragers during the conditioning phase after being preconditioned with pollen. Pollen foragers also performed better than nectar foragers in both the acquisition and extinction phases of the conditioning, when reinforced with the dual reward. Consistently, pollen foragers showed improved abilities to learn cues reinforced without sugar ingestion."

"The honey bee is a model organism for studies on the neural substrates of learning and memory. Associative olfactory learning using sucrose rewards is fast and reliable in foragers and older hive bees. However, researchers have so far failed to show any significant learning in newly emerged bees. It is generally argued that in these bees only part of the brain structures important for learning are fully developed. Here, Behrends and Scheiner (2009) show for the first time that newly emerged bees are capable of associative learning, if they are sufficiently responsive to sucrose. Responsiveness to sucrose, which can be measured using the proboscis extension response (PER), increases with age. Newly emerged bees are on average very unresponsive to sucrose. They showed that if newly emerged bees displaying a PER to 10% sucrose or lower sucrose concentrations are conditioned

to an odor, they show significant associative learning and early long-term memory. Nevertheless, the level of acquisition is still lower than in foragers. The general assumption that newly emerged bees are incapable of associative learning must therefore be reconsidered. Their study suggests that an age-dependent increase in responsiveness to rewarding stimuli is directly related to the development of early learning abilities."

"The cognitive abilities of queens are not well understood, although queen learning and memory are essential when virgin queens leave the hive to go on their mating flight(s) and successfully navigate back to the hive. Honey bee queen learning has never been previously demonstrated. Gong et al. (2018) tested olfactory learning in queens and workers and examined the role of DNA methylation, which plays a key role in long-term memory formation. They provided the first evidence that honey bee queens have excellent learning and memory. The proportion of honey bee queens that exhibited learning was five-fold higher than that of workers at every tested age and, for memory, 4-fold higher than that of workers at a very young age. DNA methylation may play a key role in this queen memory because queens exhibiting remote memory had a more consistent elevation in Dnmt3 gene expression as compared with workers. Both castes also showed excellent remote memory (seven day memory), which was reduced by 14-20% by the DNA methylation inhibitor zebularine. Given that queens live approximately 10-fold longer than workers, these results suggest that queens can serve as an excellent long-term reservoir of colony memory."

"Honey bee drones do not forage for themselves and/or for their colony, however, they require learning to navigate toward a specific location associated with their mating behavior; drone congregation areas and their home hive. They normally return to their colony during their mating flights to refuel if they were unsuccessful in mating with a queen. Hayashi and Satch (2021) tested whether homing in drones results from learning the landscape around their hives.

They compared the homing success between drones released at sites that were familiar to them (resident group) and those released at unfamiliar sites (transported group). Drones from the resident group were able to return to their hive, whereas those from the transported group could not, with the exception of a few drones that were released close to the sites that offered direct visual information for the drones to return to the hives. These results indicate that drones learn about their hives and the surrounding landscape during their flights." BC

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Pollinating The Next Generation Of New Honey Bee Scientists

An Interview with Alex **Payne**

How did you decide to pursue research in entomology?

After working in plant virology labs within the Department of Plant Pathology, I decided I wanted to conduct research in a more field-based setting. In the Summer of my sophomore year, I was accepted into a National Science Foundation-funded Research Experience for Undergraduates program. I was invited to conduct research with the invasive tawny crazy ant. It was an intimidating, yet amazing experience to execute my own research project in a limited amount of time. The hours were long and the Texas heat was almost unbearable, but I gained a love for field research that I had previously never been exposed to.

Due to my internship experience, I became fascinated by social insects. It was my first time working with insects, and I became immersed in the field of entomology.

You mention you began working with ants, what inspired you to work with honey bees?

I originally wanted to work in a pollinator conservation lab during my Summer research internship. However, since I was not aware of whether I was allergic to bee stings, it was a potential liability. My invasive tawny crazy ant experience gave me a whole new appreciation for ants and insects in general, but I still wanted to get involved with bee research. I realized that working with bees would fulfill my desire to work toward a meaningful and impactful environmental issue.

Dr. Rangel provided me the perfect opportunity to gain experience as an undergraduate research assistant in the Honey Bee Lab. It was during this time that I became familiar with many research topics associated with honeybees by working alongside graduate students and learning of former students-turned-researchers who impacted the honey bee community. Texas A&M has so many prominent researchers, including Dr. Nevin Weaver and Dr. John Gordan Thomas, who left their mark not only on Texas apiculture but the bee community worldwide. Weaver was a Texas A&M faculty member who was instrumental in establishing Texas as a pioneering home for honey bee research.

Overall, I've worked in a plant virology lab, an ant lab and a honey bee lab. The skills I acquired from these three labs helped shape my dissertation and research: honey bee disease ecology.

What influenced you to continue your education at Texas A&M in the Honey Bee Lab program?

Let me first say, many encouraged me to get my doctorate at a different institution. Some researchers viewed having more than one degree from the same institution negatively. However, Texas A&M provided multiple reasons for me to stay including family, funding, research freedom and experience.

My family still lives in Spring and by staying at Texas A&M, I could continue to see them on a more regular basis than most students who were out of state. Another big reason I stayed was the experiences and opportunities I would have by working at the Honey Bee Lab. Dr. Rangel has always encouraged me to pursue research topics that interest me. These opportunities have played a major role in deciding where to continue my educational journey. Dr. Rangel has a lot of passion as a professor and is dedicated to seeing her students and research succeed.

Dr. Rangel's lab not only offered the opportunity to conduct research, but it was evident that she was very involved in helping local beekeepers with their colonies, which is something I loved – being able to see in real-time how my efforts were helping the bees. As a result, our lab and its members are constantly involved in outreach events with stakeholders, giving talks at beekeeper meetings and even helping establish programs such as the Master Beekeeper Program.

But none of these experiences would have been possible without funding. Without that financial support, I would not have the creative research freedom I currently hold.

You mention securing funding was very important to continuing your honey bee research at Texas A&M, why is that?

While applying for graduate school, I also applied for several funding opportunities, two of which Dr. Rangel herself nominated me for. I was awarded various fellowships, which gave me six years of full funding for my doctoral program. I wouldn't have had the same amount of financial stability or research freedom attending another university.

It's a stressful job to juggle furthering impactful academic research while constantly having to fight for funding. The field of honey bee research is highly competitive with labs around the country competing for the same funding pools. So I'm thankful for the Nevin Weaver Honey Bee Excellence Endowment, which will enable the Texas A&M Honey Bee Lab to continue performing high-caliber research while funding future doctoral students for years to come.

The endowment exemplifies the true spirit of being an Aggie – former students helping the new generation succeed by passing it back. It's what I strive to do daily as a senior student in the lab. I mentor new students by teaching various lab skills and beekeeping techniques, helping them adjust to college life, and having fun participating in all the Aggie traditions.

How has your experience at the Texas A&M Honey Bee Lab program changed you?

My experience in the lab, specifically with Dr. Rangel's mentorship, has helped me become the person I am today – a confident researcher and beekeeper. I would describe my past self as timid and unsure of my abilities. Impostor syndrome is something I constantly battle, but Dr. Rangel's influence and encouragement to put myself out there has helped me mature

as a scholar. I have become a more self-confident, professional scientist and communicator. She pushed me to overcome fears such as public speaking, and I am a stronger researcher because of it.

Upon graduation, Payne is working to secure a postdoctoral position where she can diversify her skill set and continue her research studying interactions between honey bee hosts and their infectious pathogens. As she furthers her career professionally, she hopes to become a research scientist at a honeybee research facility within the U.S. Department of Agriculture's Agricultural Research Service.

*Additional information for prospective students interested in pursuing honey bee research in TX is available through the TX A&M Honey Bee Lab, local TX A&M AgriLife Extension Service offices across the state, and the TX Beekeepers Association. To learn how you can inspire students and foster opportunities for budding honey bee scientists, you can contact Jansen Merrill with the TX A&M Foundation or the TX Honey Bee Association (**https://thbea.com/nevin-weaver-endowment-fund/**).* BC

Alex Payne, a current doctoral candidate within Texas A&M University's Department of Entomology, didn't always know she wanted to research honey bees. However, working in the Texas A&M Honey Bee Lab put her on a buzzing journey that would not only require her to focus on current honey bee concerns but also on research from influential Aggies before her. She is currently studying under award-winning researcher and facilitator Juliana Rangel, Ph.D., director of the Texas A&M Honey Bee Lab and professor of apiculture.

Varroa Population Dynamics

Last month we reviewed the results of a trial comparing treatment-free cultural controls with a commercially approved acaricide (*Bee Culture* September 2021). In conducting the trial some interesting observations were made that I wish to explore further this month.

As the graph reprinted here indicates there was a surprising decline in *Varroa* mite populations in all hives that survived Winter. Each spring (monitoring events #1 in 2017 and #1 in 2018) the average mite count from a sugar dusting shake of approximately 300 bees (1/2 cup) was low. One would expect low mite counts in Spring when the colony headed into Winter with low mite counts, but low mite counts in Spring also applied to colonies that went into Winter with what are generally considered high mite levels. Some such as the five colonies in the Control group that survived their first Winter had mite counts that were quite high (averaging 22.8 mites) in Autumn of 2016 but by the Spring of 2017 had an average of just 4.6 mites per 300-bee sample. Low Spring mite counts did not correlate with the strength of surviving Spring colonies either, and were low in weak colonies as well as strong colonies.

The observation that the mite levels in colonies naturally decline during Winter is likely due to a number of factors.

Interruption of brood cycle

In northern regions like Vermont that have an extended cold Winter where the queen naturally slows down brood rearing and even stops for a relatively brief period of time during Winter, a natural break in the honey bees' brood cycle is created which in turn interrupts the mites reproductive cycle. As the treatment-free trial indicated, breaks in the brood cycle whether artificially induced by a beekeeper or naturally created by swarming or from a prolonged Winter, has a significant impact on *Varroa* population growth.

Reduced foraging activities

The prolonged cold weather also severely reduces the ability of foragers to leave the hive in search of nectar, pollen, tree resins and water. As a result, mites are unable to spread from colony to colony by hitching a ride on bees that enter hives other than their own either through drifting or robbing.

Old age

The introduction of new generations of young mites is curtailed due to the slow down and interruption of brood rearing and the lack of mites being introduced into the colony from drifting and robbing. The existing mites in an overwintering hive that get old and reach the end of their life span are not replaced, and this leads to a natural reduction in the mite population infesting the overwintering colony.

Natural mite tolerance

Another factor that may also play a role in the reduced Spring mite levels observed during the trial is the genetic tolerance level of the colonies involved. The Russian based localized stock raised treatment-free and bred for survival in spite of the mite and used in the trial arguably perform very differently from your typical Italian or Carniolan bees.

Spring build up

This means that **generally speaking, spring mite treatments in colonies located in cold regions may well be a waste of time and money**. I say generally because various factors other than just the local climate need to be taken into account. It is common to hear beekeeping recommendations that confidently state that any mite population above X percent (whether it be one percent, or three percent, or whatever) requires immediate treatment to bring down mite numbers and prevent hive collapse and economic loss. What is not considered when these recommendations are made is not just the location of the colony, and the type of honey bees, but also the time of year. In warm climates like California or Florida where Winters are brief or non-existent, the mite population suppression benefits of a long cold Winter are not realized and a one percent threshold for treatment in Autumn or Spring may be well advised. I have found however that for the kind of bees I maintain in a northern climate where the cold reduces mite population growth during Winter and the bees greatly ramp up their brood production in Spring, a one percent and even a three percent mite infestation rate during the month of May is of little concern and the bees do just fine without a Spring mite treatment.

All Beekeeping Is Local

Good nutrition matters

Spring is the time of year when my bees experience one of the major (and fairly reliable) nectar flows of the year. The Champlain Valley that lies between New York and Vermont is the best place in all of New England to keep bees. We have two major nectar flows each year (dandilions and clover/alfalfa) with numerous other flows which can be considerable but are often unreliable (goldenrod, aster, basswood, black/honey locust) and a lot of miscellaneous plants boom in between. While there may not always be a heavy flow, there is almost always at least a trickle of nectar and pollen coming into the hives throughout the entire active season (April-September). This allows colonies to build up rapidly in Spring and continue to grow throughout the entire Summer.

The importance of this fact was bought home to me this Spring by a California beekeeper who had recently moved to Vermont. We were checking some of my hives and the beekeeper seemed impressed by the strength of the colonies as we opened them. Having never kept bees in any place other than Vermont, the colonies seemed totally normal to me. I mentioned my being perplexed by the fact that so many beekeepers around the country seem to describe having small, weak colonies and that I had tended to attribute this to poor beekeeping skills and methods. She pointed out that there are many places throughout the United States that simply do not provide the food resources throughout the year for a colony to continually build up through the entire season naturally without the need for feeding on the part of the beekeeper. This is when I realized that the amount of available nutritional resources and the accompanying rate of colony build up and population growth plays a huge difference in whether a honey bee colony will outpace the *Varroa* mite population growth during the Spring and Summer months or get overwhelmed by it. Now I think I understand what they are referring to when large commercial beekeepers say that nutrition plays an important role in *Varroa* control. If you do not keep bees in an area where nectar and pollen are naturally available throughout the active season, feeding bees so their population growth is not suppressed by a lack of nutritional resources becomes an important tool in *Varroa* mite management. I also give a boost to my colony's Spring condition by leaving plenty of honey on wintering hives so that the bees rarely require feeding in Spring. Bees raised on honey are simply stronger and healthier than those raised on sugar syrup.

Estimates of Varroa *population levels revealed by mite monitoring should not be the only factor used to decide when to treat for mites.*

Mite Bombs?

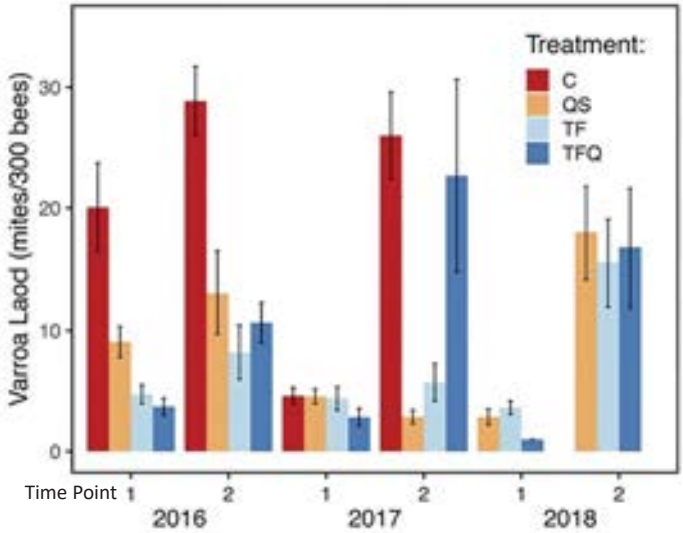
Another interesting observation I had while conducting the trial was the absence of the mite bomb phenomena that is often talked about where the mites in collapsing colonies hitch a ride on robbing bees and spread to other colonies in the area. With an untreated apiary of 15 colonies located just three quarters of a mile from the 30 treated colonies in the trial I was worried that I would see increases in mite numbers that would overwhelm the treated colonies as the untreated colonies died out from the effect of the mite. Instead there appeared to be significant drifting of mites within beeyards, but little drifting of mites between beeyards. What might account for this observation?

Timing of mite explosions

Only one control (untreated) colony was lost in each of the first two active seasons of the trial and these were lost due to queen issues,

Average Spring and Autumn mite counts.
C = control colonies that received no *Varroa* control
QS = treated with Mite-Away-Quick strip
TF = received five treatment-free cultural controls (screened bottom board, culled drone brood, rotate out old comb, beekeeper induced break in brood cycle, and genetically bred for mite tolerance)
TFQ = Same as TF except no artificial brood break induced

Varroa Loads over time*. Varroa was measured as mites/300 bees at two time points for each of three years. Time point 1 was measured in Spring and time point 2 was measured in the Fall. Red bars represent the control, orange bars represent quick strips, light blue bars represent treatment free with natural colony requeening and dark blue bars represent the treatment-free group that did not experience requeening. All error bars represent plus or minus one standard error.*



not by being overwhelmed by *Varroa*. Mite impacts in the untreated controls were expressed during the Winter months when the majority of colonies collapsed. The inability of nearby colonies to rob out hives that collapse during the cold winter protected neighboring apiaries from the mite bomb effect.

I always work to maintain strong colonies that are full of bees. It is rare that I have a colony that is weak and struggling unless it is suffering from a disease, queen issues, or I have made a split or nucleus colony, in which case I always reduce the entrance to make it easy for the weak colony to defend itself. While I would like to attribute the general strength of my bees to my beekeeping skills, the strength of my colonies is probably much more a result of the fact that I maintain colonies in a region that provides my bees with continuous access to nectar and pollen resources throughout the bee's active time of year and this helps keep colonies strong and growing all season.

Unexplained spike in mite populations

During the final year of the trial (2018) the mite population was dramatically higher than those of either of the previous two years and there were no control colonies left alive to blame and attribute the unusually high mite population to the mite bomb effect. Why were mite numbers dramatically higher in the third year than during the first two?

Unfortunately we do not fully understand the numerous natural environmental factors that may influence *Varroa* population growth. For example, one of the few long-term studies on *Varroa* population dynamics (Harris, et. al. 2003) found that variations in *Varroa* population growth rates correlated with ambient temperature and relative humidity. If confirmed, this suggests that as the general warming trends of our destabilized climate advance, it may make beekeeper's *Varroa* troubles much more challenging.

What steps a beekeeper should take and when they should act to address *Varroa* levels in their colonies really depends on many factors including:

- What time of year is it?
- Is the colony in a rapid growth phase or is brood rearing on the decline?
- Will the colony have continual access to nutritional food resources?
- What are the expected weather conditions in the apiary and will the bees interrupt their population growth because of it?
- What are the genetic characteristics of the colonies in question?
- What type of hive is the colony housed in?
- Has the colony recently swarmed or has a brood break been introduced by the beekeeper?
- Are *Varroa* population numbers surging or growing at a normal rate?

For every beekeeper, the answer to the above questions will vary and therefore the answer about what to do about *Varroa* and when will vary. When well-meaning beekeepers declare that all beekeepers must do so-and-so in order to protect their bees from mites, they ignore the numerous factors that are unique to each apiary and can impact *Varroa* and the mite's effect on colonies. All beekeeping is local. The ability of bees to thrive or decline in the face of *Varroa* mites depends a lot on the local weather conditions, available food resources, colony genetics, as well as beekeeper management and the population growth rate of the mites themselves. All beekeepers who take the stewardship of their colonies seriously should take steps to address *Varroa* mites, but what those steps are and when they should be implemented will vary widely and are contingent on the above mentioned factors. BC

Ross Conrad is author of Natural Beekeeping *and* The Land of Milk and Honey: A History of Beekeeping in Vermont.

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Please see page 89 for additions to Ross' September article.


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Minding Your Bees And Cues

Wasp Do You Know?

Becky **Masterman &** Bridget **Mendel**

With Winter approaching, your bees need less attention. Why not spend time learning about the bee family tree? Wasps and bees are close relatives and often cross paths. Some wasps forage for nectar on the same sorts of flowers as your honey bees, and often they are at the root of a misidentification where your neighbors generously offer you their compost bin yellowjacket nest, since you love bees so much.

Bees are classified in the insect Order Hymenoptera along with wasps and ants. Most winged members of the order share the characteristics of a narrow waist, aerodynamic wings that hook together while in flight, and modified ovipositors (egg-laying devices that evolved to saw, pierce or sting). Bees evolved from wasps, although the event timing is still being nailed down with the fossil record providing evidence of a bee-like wasp or wasp-like bee dating back to 100 million years ago (Rosa et al. 2021). Wasps feed on or parasitize other insects and spiders, but bees are specialized to feed exclusively on pollen and nectar, and thus have intimate, symbiotic relationships with flowers (Eaton 2021). We like how John Eaton describes the wasp-bee evolutionary relationship in his book titled *Wasps: The astonishing diversity of a misunderstood insect* (Eaton 2021).

Just like the word *bee* refers to thousands of different species, so does the word *wasp*. Also like bees, most wasps are solitary nesters. Yellowjackets live in social colonies like your honey bees and are more likely than us to join a late Summer BBQ. The common name "yellowjacket" refers to four different wasp species in the family Vespidae including the non-native and invasive *Vespula germanica* (ESA Common Names Database). This non-native member of the wasp family tree tends to dominate wasp public relations, much to the frustration of wasp enthusiasts (Eaton, 2021). While a yellowjacket encounter is often unpleasant for humans, defensiveness is definitely not a trait shared by most wasps. A trait that they all share (even the defensive ones) is that they are beneficial in some way.

Really, beneficial wasps?

Bees with their branched hairs and specialized pollen collecting structures move pollen from flower to flower efficiently. Wasps, with their unbranched, sparse body hairs, move pollen too, albeit less efficiently. But just because your toddler does a weird job putting away their toys, doesn't mean they shouldn't put them away.

Where are the birds and butterflies? Late season food meant for birds and butterflies often ends up as wasp food. Photo credit: Rebecca Debertin

Some members of the over 80 different wasp families have actually evolved specialized roles in pollination. Just ask a fig tree, but not one was bred to self-fertilize for the California fig industry. The two native U.S. fig tree species each have their own exclusive fig wasp pollinator. These tiny wasps pollinate the fig flowers (which are inverted inside the fruits) while the tree provides a place for them to raise their young. This mutually beneficial relationship earned these wasps the US Fish & Wildlife Service Pollinator of the Month recognition (Moisset).

Wasps are notorious for their pest control abilities. Some wasps specialize in parasitism. The ins (using their modified ovipositor to inject eggs directly into an animal host) and outs (the developing larvae eating their way out of the host) are described in greater detail by Dylan Miller in a blog post referenced below. Wasps also control pests by hunting for food. Some of these specialized wasps have the nicknames of cicada or katydid killers; their appearance and solitary life history is worth a look. Some of the social predatory wasps, like yellowjackets, hornets and paper wasps, are efficient hunters and will help control the bugs in your garden. We encourage a visit to the University of Maryland's Extension page for more predatory wasp information (Raupp et al 2021).

Wasps and your bees

Some of you have been reading this article waiting for the moment where we admit that yellowjackets are killing your honey bee colonies. But while these social predatory wasps might have a negative impact on your bees, a strong honey bee population is an excellent defense against them. The timing of most wasp troubles for honey bees is often later in the season when food becomes scarce for the wasps. A reduced entrance size that is easier to defend is best for your bees. If you find yellowjackets in your

depopulated hive, we suspect that deadly varroa mites and the viruses they transmit were the potential culprit for weakening the hive, making it easily invaded by wasps.

But what, you ask, about that newsworthy hornet that took up so much space on the internet this past year? Oh yes, that one. The invasive giant hornet, also a member of the Vespidae family, can indeed depopulate a strong honey bee colony in mere hours. First detected in North America in 2019 and with a recent Washington sighting in August 2021, it is important to be aware of this potential invasive predator, while being mindful that in most parts of the country, there are no giant hornets present. There are certainly more urgent honey bee health threats (Evans et al. 2020). In fact, if we could make the *Varroa* mite two inches long, we would, because then no one would tell us mites aren't a problem because they "don't see any." Side note, from the perspective of a honey bee, varroa mites are actually pretty big. We digress.

This deteriorating equipment provided an opportunity for both honey bees and wasps to rob the stored honey frames. The wax residue on the outside of the makeshift entrance is evidence that robbing took place. Photo credit Rebecca Masterman

Mistaken identity opportunities

Being a beekeeper means that you will likely hear sting stories at any social event you attend. Many involve people mowing lawns or drinking soda in August. We recommend gently defending the honey bee in these situations as yellowjackets are often the culprits. While providing enlightening evidence to the stingee, these interactions can support your agenda of centering the beauty and diversity of wasps and bees on all occasions. A practiced elevator pitch could highlight bee and wasp diversity, solitary versus social lifestyles and the importance of these beneficial insects for pollination as well as garden and crop protection. In his pro-wasp book, Eaton puts forth the argument that suburban and urban environments can invite unwanted stings and therefore a citizen movement towards native landscapes (no more wasp offending lawnmowers) and letting the parasitic wasps handle aphid invasions will support a more pollinator-friendly environment. BC

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Acknowledgement

The authors would like to thank Dr. Marla Spivak for helpful edits and suggestions.

Authors

Becky Masterman led the UMN Bee Squad from 2013-2019 and currently alternates between acting as an advisor and worker bee for the program. Bridget Mendel joined the Bee Squad in 2013 and has led the program since 2020. Photos of Becky (left) and Bridget (right) looking for their respective hives.

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Clarence H. Collison

Drought, Supers Empty, Feed Cost Up, Varroa, Overwinter (Is That enough?)

John **Miller**

It's approaching mid-August in Gackle. Last night the first measurable rainfall since July 3 occurred. As I told Reuters reporter Karl Plume, who came to Gackle in late July to survey crop conditions – 'It's Over. This crop is lost.'

This drought is tough. Most of the 2021 corn grown in N.D. is intended for grain. The lack of rain stunts the corn, farmers now chop that corn for silage. There is no second round alfalfa crop. The price of cattle feed spikes. Sales barns are busy as cattlemen respond to No Winter Feed. Soybeans show lots of stress. There may be pods on those bean plants – but the pods are empty.

Like the harvest supers beekeepers now haul back into their honey houses – empty. Bismarck beekeeper Gregg Stewart describes it: "Got some supers extracted and put away, just skipped the extracting part."

The 2021 National Honey Crop will likely be a modern honey production low. This has a big impact on decision making – I wish I could better see the future – because the time to have read this piece is in Early August, not early October.

This is no time to hold back on hive inputs. If I could – I would:

Get everyone: Clubs and their Members, Individual Beekeepers, Commercial Beekeepers, everyone to take extra steps right now to help hives survive Winter.

Feed costs are up. If syrup now costs $25/100#s instead of $20/100#s; and a hive takes two gallons of feed to ensure starvation is not an issue:

What does that cost per hive? For the Orland beekeepers I'll make this simple. Say the syrup weighs 11 pounds per gallon. At $20/100# the cost is $4.00 a gallon. At $25/100# the cost is $5.00 a gallon. Is the additional $2/hive a good investment? Yes. Feed your bees.

How do Hobbyists and Clubs get feed syrup? You can boil water in a 50 gallon tank, and slowly, slowly, slowly ad granulated sugar. Attach the ½" drill to the side of the tank, attach a long-shaft paint-mixing propeller, and drill away for two hours, sweating, spitting and swearing. You'll never reach the weight of HFCS or .665% sucrose.

Photo by Dan Koeck Photography, Fargo, ND

Save a dime mixing your own. Step over a dollar mixing your own.

Fall feeding is about adding calories, stored calories into the hive.

In your town, or a nearby town is a bottling plant, or maybe a corn processing, or sugar-beet refinery. Clubs and individuals in the clubs, cooperate. Get a bunch of cribbed, used 275-gallon plastic totes.

Call the bottler. In Worland, WY, it's the Pepsi bottling plant. In Nampa, ID, it's the Amalgamated Sugar plant. In Fargo, ND, its the American Crystal Sugar refinery. Establish a relationship. Make it easy for the plant manager to sell – say, a thousand gallons of syrup in totes. One of the club members needs a good solid tonner to waddle back to Club with 11,000 pounds of feed. Club members later tap off into hive-friendly jugs, cans, in hive feeders – several ways to feed a beehive.

Be mindful not to heat syrup over 105°F. A byproduct of too much heat is Hydroxymethylfurfural: an organic compound harmful to bees.

Varroa controls are not measurably more expensive than a year ago – but the ROI [Orland beeks, that's 'Return on Investment'.] of achieving the NUMBER TWO [2] dwarfs the cost of putting that beehive to bed for Winter in a parisitized state. The hive will die. 100% will die.

This is so painfully clear. Keep mites below 2/100.

The Bee Informed Partnership has a vast archive of data on what will happen to a hive, not maybe; but **will** happen to a neglected hive. Is no one listening? How can an industry with 15 years of the same damned thing happening to the industry for the same damned reason, over and over and over again – ignore the truth. Control *Varroa*. Anne Marie Fauvel, of the Bee Informed Project is trying to figure out how to create a **break through** message to beekeepers.

If you won't treat your hives for *Varroa* – please leave beekeeping. Neglected beehives *Varroa* Bomb the neighborhood. It's the same as ignoring Swine Flu, or Avian Flu, or Bovine Anthrax or in humans – not getting Covid vaccinated – spreading misery and disease.

If you won't treat your hives for *Varroa* – you harm beekeeping – and doom the poor hive to needless

Photo by John Miller.

suffering and death. It's negligent insecticide.

Carefully select where and how to Winter your beehive.

The best wintering method, hands down, is indoor wintering. Brandon Hopkins of Washington State University has written a superb indoor wintering guide. Dr. Hopkins recommendations need not involve a Winter Palace sized building. Many clubs could cooperate to get an indoor storage building. The fundamentals of indoor wintering are the same as outdoor wintering:

Control *Varroa*.

Adequate feed.

Clean conditions: Bottom Board: Control moth/beetle.

Manage outdoor environment with insulation/slope/inner cover/exposure.

Indoors is optimal: clean, quiet, dark, restful conditions.

Shown: One of the early American indoor wintering facilities near Arapahoe, Fremont County, Wyoming. Hand dug by George Krause in the early 1920s; a hundred years ago. Ventilation accomplished by two chimneys in the top of the now collapsed cellar; and four ventilation boxes on the four corners of the cellar, allowing fresh air to enter the cellar. It worked. It had to. George Krause had no choice. His hives arrived on a rail car. There were no roads or trucks to take hives to milder winter climate.

Hives were carried in by hand, or with a two-wheeled cart.

Modern indoor wintering building in the background. Hives are delivered by trucks, loaded and stacked with forklifts, shipped out on semis.

Droughts are tough on bees. This morning I was in the garden. I grow ornamental corn. Corn pollen has little nutrition for bees. This morning, the corn was buzzing with bees, looking for nutrition. Droughts influence decisions. Don't make poor decisions on the cusp of Winter. Take care of your bees. Your bees will take care of you. Good decisions pay. BC

Photo by John Miller.

John Miller is a retired beekeeper and volunteer Project Apis m. Board Member. Board members are tasked with fundraising.

Native Bees With Dr. Bug

Puttering about the wildflowers in my garden, I saw a honey bee and several mason bees working the black-eyed Susans. Suddenly, a large bee swooped in and began her work on one flower after the next. Apart from her size, I immediately noticed the massive, furry hind legs, reminiscent of shaggy, golden leg warmers one might wear to disco night at the local roller rink. These plumose scopal hairs impressively amassed pollen as this bee buzzed around the garden.

Svastra obliqua *by S. Droege.*

I had never noticed this bee species in my garden before, so I had to learn more. It turns out there are two similar-looking bees that fit the profile: *Melissodes* and *Svastra.* "Svastra" is Sanskrit for "sister," and anyone looking at these two bees can see the resemblance. They are medium to large hairy bees with long antennae and prominent, feathery hind legs. Females have a dark face, although light hairs may cover the clypeus (the plate between the eyes and above the mouth), while males have a yellow clypeus. *Svastra* is distinguished from *Melissodes* by the flowers they prefer, the time of year they are active, and more minute traits entomologists can point out. These include features such as a small tuft of hair on the back and an oval node where the wings connect to the body. Given the time of year and my location, the plants this bee was servicing, the size of the bee, and the tuft of hair, I determined my bee was *Svastra obliqua.*

Unlike their honey bee cousins, *Svastra* bees are ground nesters, as are 70% of native bee species. These bees are typically solitary, meaning they do not live in a colony. However, they may build nests close to others of their species and sometimes in large groups. *Svastra* bees may even share their nests with others, although each bee provisions her own egg chambers. These bees do not produce honey, rather they provision their offspring with pollen.

Svastra is typically seen in late Summer and early Fall. While some *Svastra* species are generalist pollinators, *Svastra obliqua* and *Svastra petulca* specialize in pollinating flowers from Asteraceae, the aster family. This family contains many flowers such as sunflowers, gaillardia, Mexican hat coneflower, other coneflowers, and daisies. In this family of plants, the flowers are known as composites because each "flower" is actually made up of a tightly packed group of many individual flowers. *Svastra obliqua* is known as the sunflower bee and its presence is an indicator of high-quality habitat.

To gather pollen, many bees use abdominal drumming which is a rapid movement of a bee's abdomen that collects the pollen and places it into the bee's scopa. *Svastra obliqua* does this too, but slower than other bees, and they have special abdominal hairbrushes to help them obtain pollen in this way.

Perhaps it's *Svastra obliqua's* novelty, or maybe it's an interest in the bee's taste in leg accessories, but ever since that first encounter, I always find myself carefully watching my garden in hopes of seeing her again.

To see more of these bees in your yard, plant sunflowers, coneflowers, or other composite flowers in the Asteraceae family, leave bare ground for the bees to nest in, and be very careful about pesticide usage. For more research-based information on how to help all our pollinators, reach out to your local University Extension. BC

Dr. Bug (aka Dr. Tamra Reall) is a horticulture specialist for the University of Missouri Extension. A former beekeeper and always a bee admirer, she seeks opportunities to share the beneficial aspects of these fascinating animals. To contact Dr. Bug, send emails to ***ReallT@Missouri.edu****. The University of Missouri is an equal opportunity/access/affirmative action/pro-disabled and veteran employer.*

Svastra oblique *on coneflower* by T. Reall.

PROMISE AND PITFALLS OF USING BUMBLEBEES FOR BLUEBERRIES

Lisa **DeVetter,** Maxine **Eeraerts**

*This managed yellow-faced bumblebee (*Bombas vosnesenskil*) is on a pollination mission as it works on unopened blueberry blossoms.*

Ensuring sufficient pollination is a challenge shared by many blueberry growers. While honey bees can get the job done, optimal foraging conditions may not coincide with the bloom time of many cultivars. That is why yields are smaller when weather conditions during bloom are not optimal – honey bees tend to forage less when it is overcast, cold, and/or windy. Additionally, honey bees are morphologically not well adapted to pollinate blueberry.

These challenges have caused growers and researchers to look for alternative techniques to safeguard pollination.

Bumblebees are excellent pollinators of blueberries. Not only do they forage from early morning until late at night and under cooler and suboptimal weather conditions compared to honey bees, but they are also more efficient. This is because bumblebees can buzz pollinate (or sonicate), which occurs when a bee vibrates her flight muscles, thereby stimulating pollen release. Buzz pollination is required for bees to collect pollen in an effective way from blueberry where access to pollen is difficult compared to other pollination-dependent crops. Honey bees cannot buzz pollinate, leading to less pollen on honey bee bodies to transfer to other blossoms for pollination.

MANAGING BUMBLEBEES

For blueberry growers to reap the benefits of bumblebees, they will have to rely on native populations or use managed colonies.

Managed bumblebees are raised in laboratories and sold to provide pollination services for a few weeks. Use of managed bumblebees to provide or enhance crop pollination is not new. Growers around the world have been using commercially raised buff-tailed (*Bombus terrestris*) and common Eastern (B. impatiens) bumblebees for years. The Western bumblebee (*B. occidentalis*) was also deployed in the 1990s in the Western U.S., but a disease outbreak decimated managed colonies, led to severe declines in native bumblebee populations, and this species is now unavailable to U.S. growers. Western growers consequently had no managed bumblebee species. However, this has now changed.

Yellow-faced bumblebees (*B. vosnesenskii* or *B. vos*) are now available for pollination in open fields in the Western U.S. A bonus – *B. vos* is native to Western U.S. As researchers working on crop pollination and recognizing the benefits of native pollinators like bumblebees, the arrival of *B. vos* should be welcomed news, right?

While use of managed bumblebees is alluring, caution is warranted, and further research is required. Why the caution?

Blueberries have an urn-shaped blossom that bumblebees are adapted to pollinate, while honey bees struggle.

Pathogen spillover is the biggest concern. Managed bumblebees often contain higher pathogen loads, which they can transmit to other species. Pathogens are deposited on flowers by visiting bumblebees and subsequently transmitted to other species that visit the same flowers. The increase in pathogen load and possible introduction of new pathogens threatens the health of wild bumblebees already struggling or at risk.

Another mechanism whereby managed bumblebees can affect the wellbeing of native populations is through competition for floral resources before and after blueberry bloom. Over time, densities of managed bumblebees can increase. These expanding colonies can rapidly gather large amounts of nectar and pollen, leading to local resource depletion for native pollinators.

Both pathogen spillover and resource competition impact other pollinators, including solitary bees and honeybees.

STATE-LEVEL RESPONSIBILITY

While USDA controls movement of bees between countries, it is up to individual states to regulate their movement within and between states. This has led to variable and inconsistent rules and enforcement, putting the burden on companies, growers, and crop advisors of responsible use of managed pollinators like bumblebees.

What to do if you have used managed bumblebees on your farm? Despite being sold and advertised as "native," used quads should be destroyed (i.e., burned or frozen) after bloom to limit their potential negative consequences. After crop bloom, *B. vos* transitions to foraging in native habitats, gardens, and elsewhere, where flower density is lower and therefore the likelihood of spreading pathogens to other species increases. Do not release managed bumblebees into the wild or rely on queen excluders – queens may pass through excluders. Previous experience with the Western bumblebee is an important cautionary tale of the potential negative effects of managed bumblebees.

Furthermore, support research efforts! While several growers we interact with expressed dissatisfaction with their first experience with managed *B. vos*, the potential of bumblebees is real. However, successfully integrating them into a viable on-farm pollination system requires research that identifies the promises and mitigates pitfalls associated with using these promising pollinators. BC

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BUILDING A MIGRATORY COVER – CEMENT

Ed **Simon**

Earlier this year (2021) the cost of lumber rose to unprecedented heights. Within ten weeks the cost of plywood doubled. The migratory tops that Ron Stevenson and I make took a major hit when ½" plywood went from $32.00 for a 4 x 8 sheet to $73.00 a sheet. Years ago, someone mentioned to me that they built tops from cement. Specifically, the cement or concrete backerboard used as a base for floor and shower tile. The cost of a 4' x 8' sheet of this backerboard was currently $24.00. Only 33% the cost of the plywood.

Since we had just received a request for a volume of migratory tops, we decided to see if we could offer cement tops as an alternative. We knew it would take time and testing to see if the results would be acceptable.

This is the result of our venture in making cement migratory tops.

There were problems/questions to be tested/solved before we could proceed.

1. Will cement adhesive adhere to the wood cleats?
2. Can the backerboard be cut without excessive chipping?
3. Can we use staples to build the tops (not the special screws recommended)?
4. Which of the two readily available backerboards would work best?
5. Will the tops crack when treated roughly? (Thrown around)
6. What type of paint is needed?
7. Will they hold their shape? (Not twist or warp)
8. Are they heavy enough to not require a "rock" to prevent them from being blown away?

The first question was answered by pure luck. While searching for a cement/concrete adhesive, I looked up and there was the answer. There was a strip of wood showing cement adhesive attached to it. Much to the salesclerk's concern, I tried to pull the strip of adhesive from the wood. I could not remove it!

We then purchased 3' x 5' panels of the two different backerboards and a fiber cement blade for the circular saw. Both boards were able to be cut easily, although one produced more dust and chipped easier than the second. This answered question #2.

Note: Cutting the backerboard by scoring it and breaking it, although easy, produced ragged edges which was not acceptable for our tops.

Then we then tried using staples for attaching the cleats to the backerboard. Occasionally a staple would go astray when it hit a piece of aggregate used in the cement. This was a minor problem compared to the extra time and cost that using the special screws would entail. Problem #3 answered.

Question #4 was resolved by looking at the edges of the cuts. One was clean and smooth and the second was chipped and rougher. We decided on the brand Permabase® produced by National Gypsum.

Question #5 was resolved through testing.

The first attempt of creating a cement migratory top ended in a dismal failure. We slammed and tossed them around and a problem literally popped out. The wood rim lath partially separated from the cement and caused cracking. The cleats attached to the backerboard worked perfectly, but the rims attachment did not. The staples for the cleats were applied through the backerboard into the wood cleat. This seemed to provide for a solid attachment. We had applied the staples for the rims through the wood into the backerboard and this allowed the backerboard to come loose from the rim. In a later test we applied the rim staples in the same direction as the cleat staples. This helped solve the separation considerably but not completely.

We then tested additional construction adhesives, hoping for better adherence. Eventually we decided on using Liquid Nails Fuze-It™ for the adhesive. It was the most expensive but the savings on wood cost will more than compensate for the adhesive cost.

Note: The use of backerboard screws was difficult to manage. Any excessive penetration of the screw head caused board chipping.

For painting, we tried the no cost recycled exterior latex paint on the tops. Two coats seemed to adhere and looked as if the cheap paint would work. To fully answer questions #6, #7 and #8 will take a year of exposure to the elements. Permabase® has a smooth side and a rough side. Initially we used the smooth side on the top of the top and the rough side on the bottom of the top. Eventually, through testing, we changed our design to place the rough side toward the top (sky) and the smooth side toward the hive. It was considerably easier to paint the rough side than to try to fill in the bubble holes that were in the cement on the smooth side.

We believe that warping will not be a problem and the problem of plywood delamination does not exist.

Subsequently, a test set of 20 covers were built and will be given a real-world test this Summer.

Parts

1. 16¼" x 22" – Top (1)
2. 16¼" x 1½" – Cleat (2)
3. 1 ¼" x 20⅜" – Lath side Rim (2) – ¼" depth per layer
4. 1¼" x 14⅝" – Lath end Rim (2) – ¼" depth per layer
5. Construction adhesive – Liquid Nails – Fuze-It
6. Spackle
7. Special tool - fiber-concrete blade for a circular saw.

Construction

Using Jig 16, cut the 4' x 8' sheets of backerboard into strips and then use Jig 22 to cut these strips into the length needed for the tops. Then the end cleats are added to the top. The rim is added, and you complete the top with two coatings of free paint.

Step 1: Create two jigs.

I am a firm believer in using jigs whenever repetitive operations need to be performed. Use the drawings "Jig 16" and "Jig 22", to create these jigs for the width and length of the top. The jigs allow you to position a cutting guide for the circular saw. Using them result in straight cuts and a consistent top size.

Warning: These jigs position cutting guides, so the guides are offset by the distance of the saw cutting guide and the blade edge plus the blade kerf. The 1½" measurement in the drawings is for reference only. You need to use your own measurement. Be sure to double check the jig before committing it to use.

Step 2: Cut the top (part 1).

Using a fiber-concrete blade on a circular saw and your two jigs, cut the 4' x 8' backerboard into 10 migratory tops.

Place the jig base against the edge of the backerboard and then clamp the cutting guide to the backerboard. Remove the jig and the guide will be positioned correctly. Be sure to double check all measurements and perform a test cut before committing yourself to a complete cut.

Ref: See the Drawings section for the cutting layout of a 4' x 8' sheet of backerboard.

Note: Cut from the smooth side. The saw glides easier on the smooth surface.

Note: A 3' x 5' backerboard will allow for three tops. The 4' x 8' sheet of backerboard allows for 10 tops. Three tops at $3.33 each or 10 tops at $2.50 each. (spring 2021 prices)

Note: A 4' x 8' Sheet of backerboard is heavier and more flexible than its plywood equivalent. Use caution and help.

Warning: Wear safety glasses! Small cement and stone chips will chip regular glasses and harm unprotected eyes.

Step 2: Cut the cleats (part 2).

The width of the cleats is based on the use of a rim. The width of the cleats is 1" plus the thickness of the rim you need. This calculation ensures the cleat will have a 1" overlap on the hive body.

Note: A 1" x 8" x 8' board will be able to be cut into 20 16¼" x 1½" cleats.

Step 3: Add the cleats (part 2).

Use construction adhesive (part 5) and staples or backerboard screws to attach the cleats to the top.

Important: The staples should go through the top into the cleat!

Information: The Permabase® backerboard has a smooth and a rough side. After testing, we positioned the rough side on the top. The smooth side has lots of tiny holes which are not easily filled with paint. The rough side has no holes, so it paints easier and better.

Step 4: Cut the side rims (part 3).

Set a stop-block on your radial arm saw and cut the lath for the rims.

Depending on the depth of the rim you need, you may need to cut additional pieces. Each additional piece adds ¼" to the depth of the rim.

Hint: Measure the distance between the cleats of your top. Cut the length slightly shorter than needed for an exact fit, this wiggle room allows for flexibility during assembly.

Note: Lath is available in most lumber stores. Unfortunately, it is not of consistent size and quality. It is sold in bundles of fifty pieces. Each piece is about ¼" thick and four-foot long. Choose a bundle that is consistent in thickness and of decent quality. The width of the strips does not make any difference.

Note: By adding the lath (rim) to the underside of the top you provide a larger space above the frames in the same manner as an inner cover and it adds rigidity to the top.

Step 5: Add the side rims (part 3).

Using construction adhesive and staples add the lath cut in a previous step to the underside of the cover. If using multiple layers of lath, assemble the rim first. Use exterior wood glue between the wood layers. Then add the wood to cement adhesive (part 6) to the still wet assembly. Install the rim to the top by placing two alignment staples from the wood into cement top to hold the rim in place. Then turn the top over and add the cement to wood staples to finish the installation.

Step 6: Cut the end rims (part 4).

Measure the distance between the side rims that you installed in the previous step.

Set a stop-block on you saw and cut the lath to your measurement less a ⅛" wiggle room.

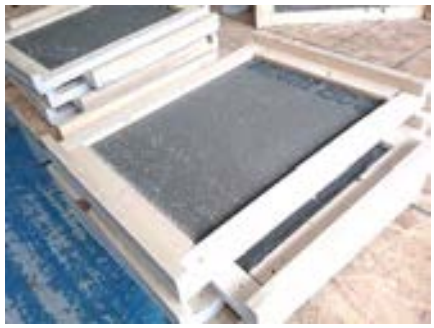
Step 7: Add the end rims to the top.

Glue and staple or nail the lath cut in the previous step to the ends

on the underside of the cover using the same technique you used in the previous step.

Step 8: Spackle the edges.

Using exterior spackle, coat the edges of the top. Then sand the spackle when it is dry. This makes the painting of the top considerably easier.



Step 10: Paint the cover

Using the external latex paint, you got from the recycling center, paint the cover.

Two counts of paint are needed, you should be extremely careful about covering the end grain of the cleats and the side grain of the lath.

Conclusion

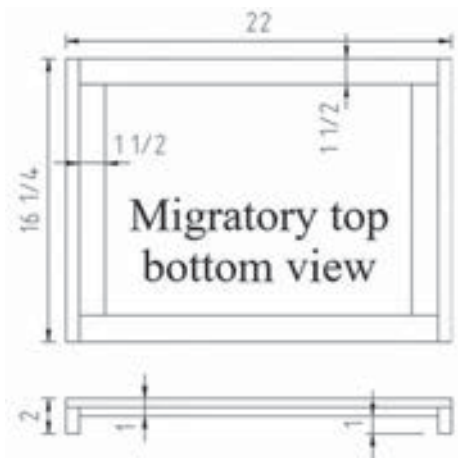
Cheap, easy and fast to build, this migratory top will last for a decent time. With a cement top, warping should not be a problem. The extra weight of a cement top may also eliminate the need for the rock you place on your covers.

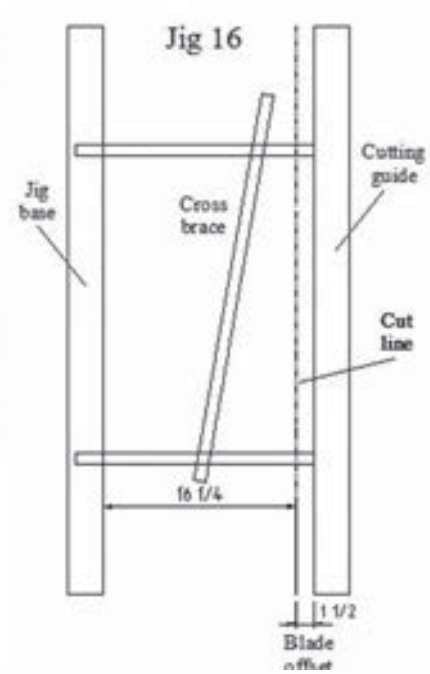
The tops we made will now undergo a yearlong test to prove or disprove the usability of using a cement backerboard as a migratory top. BC

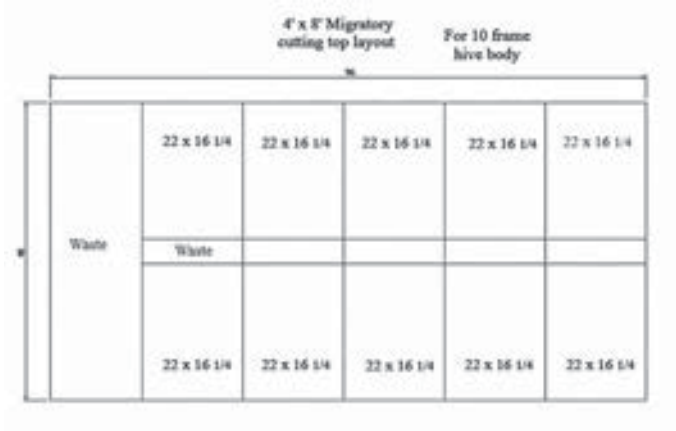
Drawings – Migratory Top

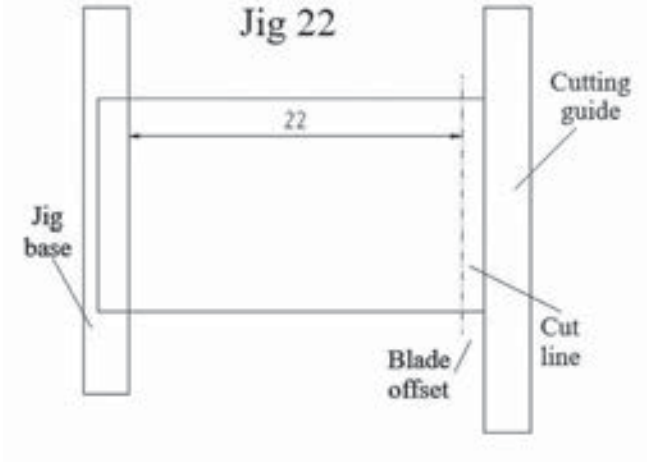
Note: The double rim lath of ½" is used to keep the hive heights consistent with older migratory tops.

This was needed to help with the stacking of pallets and hives for shipping.









Get a copy of Ed Simon's new book Build Bee Equipment with detailed drawings, construction hints and how-to-use instructions for over 40 beekeeping tools and equipment from ***www.LULU.com****. Under the LULU sales section, search for "Beekeeping". Ed can be contacted through* ***SimonEdwin41@gmail.com***

BIGGER PICTURE

Jessica **Lawrence**

Fall Bees

For some reason, it seems like I've talked to more beekeepers than normal lately about their odd beekeeping habits. I think one of these is because of hanging out with Beamon, my Virginia beekeeper, and we don't necessarily agree on a lot of ideas. The thing is, I never really appreciated how much information you pick up from going to bee meetings, reading bee magazines, or conversing with other beekeepers. Not all of that information is good, or useful, but it is still good to know what's out there. It's also good to remember that there's a lot of different ways to keep bees, and as long as your bees aren't dead, then you're doing okay. I've been off and on arguing with Beamon over some of his beekeeping ideas, but in reality his bees look pretty good and his queens are big girls with good brood patterns, so he doesn't really need my advice from the looks of it.

My beekeeping is a lot different from the average hobbyist because most of the things I do are for consistency on a large scale and I don't really have a lot of time to try out new ideas because the bees are usually already in a study and there's no room for variables or things that might be a detriment. There's a lot of things I take for granted that are ingrained just from so many years working in the field with bees in science that I just don't think about when I talk to other people. For example, how many hives can successfully stay in one area? What's the maximum number of hives before you reach overpopulation? Bees may be able to forage for a pretty good distance, but you can overpopulate an area. Sometimes this depends on what you are doing with your bees. If you just need a place to put some, throwing a bunch of hives together isn't that bad as long as you keep them fed and check their food stores. If you're pollinating, you are going for production. Typically, almond growers want two hives per acre for pollination, while melons and blueberries may be two or three hives per acre. Now, we've all heard that bees will fly up to five miles for foraging, which is around 3,200 acres. Even just calculating this based on one mile foraging, its around 640 acres. While this might seem like you should be able to put 640 hives in one spot to pollinate that area, this is obviously way too many hives to sustain ecologically. Practically speaking, putting hives out in a field for pollination usually involves pallets of four hives being strategically placed around the field at the general request of the grower. Not only do you want to maximize your pollination service, but you also don't want to pay to help someone else pollinate when you've paid for your crop.

Now that the bees are in from honey production, pollination, or just hard Summer work for the girls, they are tired and ready to be put up for Winter. Hopefully, you've started your Fall prep before October, but if you haven't done anything yet there's still time. The Fall flow in your area really determines your Winterization habits. Here in North Carolina, our Fall flow can be anywhere from August through October, depending on hurricane season and temperatures. We've had early goldenrod starting in July this year which makes me think it's going to be an early Winter. Some of you will leave the Fall honey for your bees, and some of you will harvest it. I think most people have heard the rule of thumb that you leave one deep super of honey for your bees to overwinter, but if my hive is big enough to overwinter as a double without the honey, I try to leave them more. If it's October and I have around 12-16 good frames of bees in a double, I will make sure they have at least a capped frame of honey on each end of each box, plus a deep super full (when possible). Depending on what the colony looks like, I'll go ahead and start feeding too. Let's go over the ratio for sugar syrup again because it bears repeating. I'm not sure where some people learn math, but a 1:1 ratio means equal parts. A PhD scientist who was fired from a place I used to work left meticulous notes on her beekeeping experiences. She could not figure out why her colonies wouldn't take her sugar water. At a ratio of 1 pound of sugar to 1 bucket of water, she was putting enough sugar in to make it unpalatable as both syrup and water. I have no idea where she got this idea, and I don't even think the buckets she used were the same size. She did a lot of other stupid things relating to bees, but for now, this is the only one relevant to sugar ratios. When you are mixing your sugar syrup, you only have two options to do it correctly. There's a 1:1 ratio, and a 2:1 ratio. A 1:1 is roughly eight pounds of sugar to each gallon of water. I won't say it often, but there's no need to be precise in this measurement as long as you're close. A gallon of water is roughly 8.3 pounds, but eight pounds of sugar is just fine. You're still going to need warm or hot water to melt the sugar down even slightly under 1:1. When you use this ratio, the bees are getting "fast food" that they can use to take care of their babies and sometimes store. There are some people who argue this point and say this isn't used for honey, or the concentration of sugar isn't high enough. I guess these same people have never thought about what concentration of sugar is in nectar, which has to be above 20% for most insects to find it worth the energy cost to collect. On a side note here, I think it's interesting that some of the best nectar sources for bees based on sugar content are often overlooked, like willow and chestnut trees, most of the brassica family (radishes, mustards, broccoli), and dandelions, while the crops we force on bees

(blackberries, plums, peaches, pears) are some of the worst. Willow and Chestnut, for example, tend to have sugar concentrations over 60%, making their nectar particularly attractive. A 1:1 ratio of sugar is going to give you a 50% concentration, since half of your syrup is sugar by weight. If you want to do a 2:1 ratio, you're going to need 16 or 17 pounds to the gallon. I would stick with 16 just for ease of math, but 17 is closer to the ratio if you want to round your numbers for weight. You'll definitely need some simmering water for this, but don't let it burn because caramelizing your sugar will kill your bees. When sugar heats up too much, it creates HMF, which you can look up on your own, but it's a compound that is toxic to bees. You can dissolve a 2:1 without boiling your water, and you might be able to get away with lightly toasting your syrup without killing your bees, but I wouldn't risk it when you know it has potential to be dangerous . . . and waste all that time and money.

Besides feeding your bees, I always recommend treating for mites at least in the Fall. While the directions on Apivar or Apiguard give a temperature range, I've found it to be common to burn a cycle of brood out if the outdoor temperatures are over 90 for any extended amount of time. These are the only two miticides that I use, but I have heard a handful of people discussing resistance with Apivar. Make sure you treat for mites as early as possible so if you do lose a round of brood, it's not quite as detrimental as losing one of your queen's last cycles of Winter bees. I would strongly suggest doing a mite check before and after, even if it's just a sugar shake. Beamon doesn't seem to be doing much for mites other than trying to control breeding stock, and we've argued about this a lot but his bees appear to be okay. I'm going to sneak into his hives and do a mite count when he's not paying attention to see what he's working with, but he puts a lot of work into his however many hundreds of hives he has, and it's possible that frequently splitting your colonies can have a significant impact on your mite control for breaking brood cycles. For the typical beekeeper that's not Beamon, I would strongly suggest treating your bees for mites in the Fall if you want to have bees in the Spring.

Beamon and his swarm.

Between treating and feeding, I would also recommend entrance reducers in all the hives on the smallest opening. One of the first things I learned in beekeeping was to turn the reducer to the solid flat part laying against the bottom board. This makes sure that the bees can get out even if dead bees clutter the inside and they aren't trapped. The entrance will be above any dead bees and allow exit and entry even with debris. Robbing can be rampant at this time of year and giving them a smaller entrance can reduce stress on the colony for guard bees and stop some cold drafts from coming in. I use IPM bottom boards year-round, but I slide the corrugated plastic used for counting mites into all the bottoms during Winterization. It allows enough air flow to keep excess humidity out of the hive, but it blocks the majority of cold air and allows the bees to keep warm. If you are much farther North than me, you might want to switch bottoms. When we overwintered in Wisconsin, we did this same thing but also wrapped the hive in bee cozy Winter wraps and only lost a few hives out of around 100 (they were crappy going into Winter too so not unexpected).

There are a lot of additions here that people can tell you. Some add Honey-B-Healthy to their sugar syrup. Some add pollen patties to boost their Winter bee brood production. There's plenty of other nuances that can be done for winterization, but if you can feed your bees, treat your bees, and keep them warm, there's a good chance your girls will be ready for Spring splits with few casualties. The important thing is to find out what works for your bees and environment. If you can keep your bees alive through Winter with beekeeping voodoo like Beamon, then you probably shouldn't change what works for your colonies! BC

Never
Discourage Anyone Who
Continually Makes Progress,
No Matter How Slow.

The Proud Frame

Greg **Carey**

Same Honey – Less Equipment

"A penny saved is a penny earned." - George Herbert

Unless you have been in my garage or bee yard within the last two years or work in the front office of one of the several equipment suppliers to whom I have sent this proposal, you probably have never heard of the Proud Frame concept. The Proud Frame is a way for beekeepers to reduce the number of supers and frames in their inventory by 15 to 30 percent while harvesting the same amount of honey. Let me explain using some round numbers, so you can visualize its impact on your operation whether you are a large commercial beekeeper or a backyard hobbyist. If you run 1000 ten-frame hives with four medium supers on each and your Proud Frame advantage is 25% then you will reduce your equipment inventory by 1000 supers and 10,000 frames. That is 10,000 fewer frames to uncap, extract, and store. If you stack 100 supers on your truck, that is 10 less truckloads. If your extractor holds 20 frames that reduces your extractor runs by 500. You get the idea, and hopefully it gets your attention and keeps the editor from accusing me of burying the lead. Before I forget, the primary element that took me down this path was to get a Frame of Proud cappings that could be easily uncapped with the hot knife in one swipe. It does this. This is an exceptionally good approach to getting the greatest yield from honey supers in the most efficient way possible.

Background

When I first got into beekeeping in 2008 the beekeepers in this area all used 10 frame Langstroth equipment, so that is how I kept my bees in the beginning. When we discussed the weight of the equipment many beekeepers recommended only putting nine frames in the hive bodies and supers. They sold this as a weight reduction and a benefit to uncapping as the bees would draw the super combs proud above the frame top bar, making it easier for the knife to reach the cappings across the whole frame. They also liked to point out that the supers would hold more honey due to the tenth frame not taking up space that is now filled with drawn comb. Yet another benefit was that you only needed to extract nine frames instead of 10.

The practice of using nine frames in a 10 frame super required you either place the frames in position by best guess for distance, use a frame spacing tool, or install special, permanent frame rests which locked the frames in place.

Analysis of One Less Frame

First, let's look at the points that contradict and defy logic, weight saved due to reduced frames and more honey per super due to the removed frame. We cannot have it both ways as clearly honey weighs more than wooden frames.

The next one is that the bees put more honey into a super that only has nine frames versus 10. It increases the frame weight but does not increase the volume of the super. Once we look at the space taken up by the frame in the comb area of a super, we see that removing a frame only clears the space taken by the foundation and capping, almost 3/16th inch. This is not a significant amount of space saved across 15+ inches.

The proud capping is a benefit when using a knife to uncap the frames. You do not need to go back and make several cuts or use a scratcher to open the missed cells. However, the nine-frame spacing allows the bees to draw the cells extra proud, causing more than a small amount of honey to go in the cappings tub rather than the extractor.

As for the benefit of only extracting nine frames instead of 10, my extractor handles four medium frames or two deep frames. This can result with an unbalanced extractor jumping all over the room. Minor when placed across the whole harvest but still.

The placing of the frames into the super at the proper space is no problem if you have the nine-frame frame rest. The frame rest locks them into place but requires you to pick them straight up for removal. Propolis can turn this into a negative. The frame rest install is permanent. Nine frames it is. If you do not have the frame rests and use the frame spacer as I did, or just depend on your judgement without the spacer, your initial replacement of the frames after an inspection requires more than a little care. It is amazingly easy to press the bees into the comb surface when you have sacrificed the frame-shoulder bee space protection. Honestly, I did this more than I care to admit.

Finally, I have long since converted to using eight-frame equipment due to the weight and have never heard an acceptable discussion on how to get proud comb drawn in other than 10 frame equipment.

Proposal

The Proud Frame conversion consists of three adjustments to your current wooden frame design that are quite simple to implement. The changes can be used on ALL future frames, regardless of size, without affecting their use in current applications in conjunction with old stock and inventory. You can replace current frames through normal attrition without worry. You may wish to continue the nine-frame practice. The Proud Frame will not interfere with that practice even though it has made it obsolete. You will be able to intermix the Proud Frame with older style frames without concern as the shoulders will continue to set bee space and prevent bees from being caught and mashed into the comb.

Steps to convert a wooden frame into the Proud Frame
Top Bar

Your current top bar measures one inch in width. The Proud Frame top bar measures 7/8 inch in width. I used the table saw to remove 1/16 inch from each side of the top bar. This is needed for proud comb.

End Bar

Your end bar width measures 1-3/8 inch. I increased the effective width of the Proud Frame end bar by 1/8 inch to 1½ inches.

I used a small wood screw on one side of the end bar with an 1/8-inch head space. The screw allows for adjustment in width. By placing the screw on opposite sides of each end of the frame, you only need two screws per frame, and the frame can be placed into the super without worry of direction. This is needed for proud comb and increased capacity.

Available Space

You see the space available that will be used for honey in an eight-frame medium super before and after the modification.

Inside body width:	Proud Frame width:
10 Fr - 15 ½"	10 Fr - 15"
8 Fr - 13 ¼"	8 Fr - 12"
5 Fr - NUC - 8 7/8"	5 Fr - 7 ½"

Note: Your body width may vary, but none that I have found are less that the Proud Frame requirement.

Uncapping

Here is a frame chosen because it is not completely drawn out. You will notice that even the uncapped cells are drawn above the top bar width. You will also notice that the cells are not drawn so far above the top bar as to cause excessive honey going into the cappings tub. This is a first year super drawn from plastic foundation (more on that later).

Did You See That?

Our simple modifications achieved the goal of having cappings that are easily removed with the knife, but there was a little thing harder to see. The shoulder screws on each frame used an extra 1/8th inch of the inside super space which the bees filled with honey.

The Math

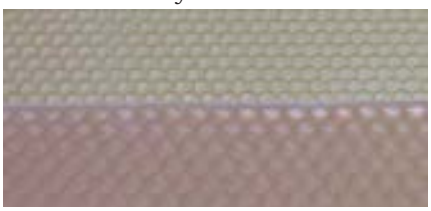
When I did a search on the weight of a medium frame of honey, the prominent answer was six pounds. When I calculated the weight using my 20 oz. per pint honey, I came up with 6.19 lbs. of honey in an unmodified frame. The delta may be due to wax displacement, rounding, or internet variation. The 1/8th inch increase in honey storage will add one pound of honey to each frame or eight lbs. per eight-frame super. The super yield goes from 48 to 56 lbs. 56/48=1.167

Foundation

I know that changing the foundation is not an actual frame modification, but this is one of the elements mentioned earlier. For the life of me I cannot understand why no one has talked about this as a means of increasing honey capacity in the super, making the drawing of honeycombs more efficient, and increasing the extraction yield with less work. Maybe it is out there, and my few years have not been able to find it. I have queried many suppliers, and none offer the medium plastic drone foundation. So, I put this before you for extra serious consideration.

We need plastic foundation for medium frames with drone size cells imprinted on it!

Here is why!



This photo shows there are significantly fewer cells in the same area of drone comb as compared to worker comb. Those reduced cells mean reduced cell walls that the bees must draw out. It also means less cell walls taking up space that will hold honey. Finally, it means less surface area for the honey to stick to during extraction, making extraction much more efficient. Having this configuration foundation in plastic would provide honey producers a rugged foundation that the bees can more efficiently draw out and from which the extractor can easily squeeze the last drop.

Many have done considerable work compiling information on comb drawing that is well worth our time to study and understand. The focus to some extent seems to be reducing cell size in the brood nest area to achieve a natural sized honey bee by reducing the spacing of the frames. Most of the early studies also focus on reducing the cell size to prevent the production of those worthless drones in the brood nest. Historically drones were not encouraged for IPM purposes or for queen rearing for that matter. Drone cells were bad! But let's be clear. We are talking about frames for more profitable honey production, a reduction in

equipment and operational costs. These frames can be used in the brood nest with worker foundation for brood production or with drone foundation for drone production, but we are focused on honey production, and since there are roughly 55-79% (depending on the cell sizes used) more worker cells than drone cells per frame, we wish to relieve our workers from drawing all those cell walls on honey frames. Every talk I have heard on drawing wax makes the point that it takes eight pounds of honey to make a pound of wax.

Unfortunately, the only drone cell foundation I have found is wax foundation for deep frames (I cut these for my purpose) and plastic frames for *Varroa* control. One producer suggested I buy their plastic drone frames and cut out the foundation to use in my wooden frames. I have not yet arrived at that logic.

Wooden Frame Summary

The primary advantages for the Proud Frame in implementing the first two changes to the wooden parts of the frame are that the cappings will be proud just above the edge of the top bar, allowing for a smooth cut of the cappings with very little honey falling into the cappings tub and the increase in cell height which yields more honey per frame (1/8th inch/frame) by using super space that is not used by the standard frames.

My honey on average weighs 20 ounces per pint or .7 ounces per cubic inch. If I add 1/8th inch of honey to a medium frame with a comb area of 89.25 square inches and ignore the cell walls, that equals 11.15 cubic inches or 16 additional ounces of honey per medium frame.

The Proud Frame, with the addition of drone-cell foundation, will slightly increase the amount of honey per frame and greatly relieve the honey bees of the need to draw out all the cell walls for worker sized cells.

The Proud Frame concept delivers all the positive attributes of running nine frames in a 10-frame super while relieving the need for any special consideration or support, i.e., frame rests, spacer gigs, or bee crushing due to frame movement. The Proud Frame concept can be easily used in all sized equipment and is not limited to the 10-frame configuration.

The Proud Frame is completely interchangeable with standard frames and can be used as such with no worry to the beekeeper.

Plastic Proud Frames

We are at the bee meeting, and someone asks what is the main purpose of the frame? The grizzled beek in the back blurts out that that is what the bees live on. We all nod in agreement and couldn't be more wrong.

The bees DO NOT live on the frame; the bees live on the COMB!

The frame is a rigid device (skeleton) used by the keeper to handle the comb for inspection, honey harvesting, making splits, balancing stores and brood between colonies, etc. The keeper needs that rigid skeleton, the bees do not. The less space taken inside the hive by the frame the more space for comb.

Plastic Frames

This discovery surprised me.

The first thing noticed when picking up a plastic frame is that its skeleton is significantly thinner than a wooden frame.

This means there is more space for comb building inside the frame skeleton.

Current Frame Measurements

Standard Plastic Drone Frame
OD – 6 3/16"x17 5/8"
ID – 5 15/16"x16 15/16" equals 100.56 sq.in. or 7.12 lbs. of honey

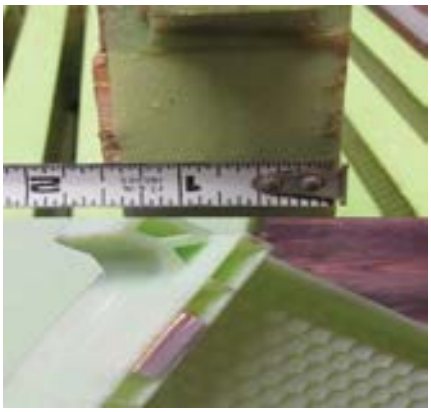
Standard Wooden Worker Frame
OD – 6 ¼"x17 ¾"
ID – 5"x16 15/16" equals 84.69 sq.in. or 6 lbs. of honey (Proud Frame Upgrade 7 lbs.)

The standard plastic frame has more honey storage space than the wooden frame that is upgraded to the Proud Frame.

The plastic frame is resistant to modification, but the top bar measures at 15/16". Not the desired 7/8" but less than one inch.

The end bar width measures the same as the wooden frame at 1-3/8 inches. We need the end bar to be 1½ inches.

I used a wooden insert to increase the end bar width by 1/8th inch. I placed another flush insert into the opposite side of the end bar to prevent the long insert from locking into the adjacent frame. By placing the long insert on opposite sides of each frame end, the same as the screw on the wooden frame, I accomplish a frame which cannot be placed into the super backwards. It works and maintains space regardless of the orientation. In the photos you see that I used propolis and bees wax to fix the insert in place.



That adds 1/8th inch more honey per frame, which calculates to 1 extra pound per frame or a total storage gain of 2.12 pounds. Two extra pounds of honey in the same space we currently get six pounds seems significant to me. 65/48=1.35

The Goal

Of course, getting a supplier to offer drone frames with the 7/8th inch top bar and 1½ inch end bars and the same outside dimensions as wooden frames is the goal.

These could be in wood or plastic frame and easily promoted for both honey production and drone production for queens and IPM. Most of what I have found concerning durability of wood versus plastic has been anecdotal and suggests that wood is more inclined to come apart. However, I know that there is more than one abusive way to uncap a frame of honey. These studies are beyond my limitations, and I would be glad to see such but will continue to use the knife.

I would also like to see plastic drone cell foundation offered in all

frame sizes and know that there is a market for this.

A supplier offering drone frames with the 7/8th inch top bar and 1½ inch end bars is a given. I can even see a market for a plastic insert for the current plastic frame end bars to increase the width to 1½ inches.

Finally, the benefits I see are easier, more thorough extraction of drone cells. The fact that it takes less wax to draw out a drone frame using less honey and less bee time. The cappings proudly project above the top bar for easy uncapping. Without a special rest or spacer, the frame uses previously empty super space for an extra 1/8th inch of honey per frame and reduces your super requirement by 15 to 30 percent depending on the Proud Frame advantage, reducing the equipment and labor costs. I cannot imagine a single honey producer who would not agree that each of these are beneficial.

The reason your Proud Frame advantage is variable is because each part of the modification is independent of the others and can be implemented individually, top bar, end bar, drone cells, plastic frame.

It is better to reduce your costs than to raise prices. Feel free to use this to make your own Proud Frame or wait on a supplier to pick up on this. You know your strengths. BC

All The Buzzz in...

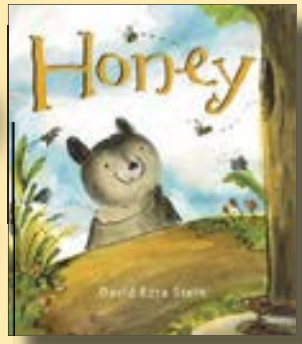
Hello Friends,

Hoping you are happy and healthy!

Bee B.Queen

Bee B. Queen Challenge

Write a story and make a book!



Honey
by David Ezra Stein

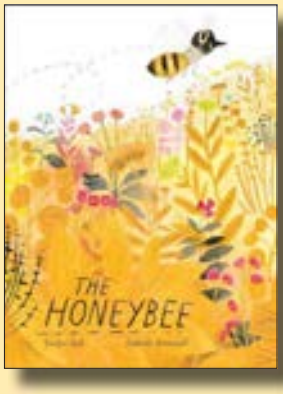
Here is a bee inspired board book for your tiny brother and sisters. A curious young bear thinks about his favorite thing – honey! Recommended for babies up to 2 year olds.

Bee Books

Make your way to your public library and check out these books about bees. There is something for everyone!

Give Bees a Chance
by Bethany Barton

An enthusiastic bee-loving narrator tries to convince a friend that is afraid of bees that our fuzzy, flying neighbors are our friends--we should all give bees a chance! Recommended for ages 4-8.

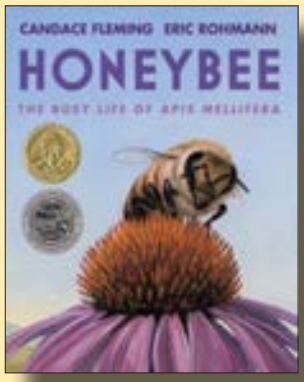


The Honeybee
by Kirsten Hall

Follow honeybees from collecting nectar to making honey through the rhymes and rhythm in this delightful picture book. Recommended for ages 4-8.

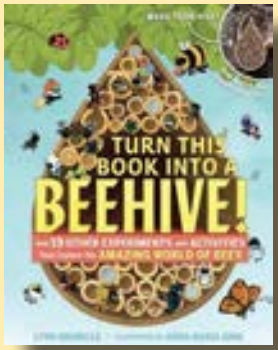
The Bee Book
by Charlotte Milner

Looking for a wonderful nonfiction book? This is it. You'll find out what happens in the hive, what pollination is, how honeybees talk to each other, how we can help them and much, much more! Recommended for ages 5 – 9.



Honeybee: The Busy Life of Apis Mellifera
by Candace Fleming

This multiple award winning book rises to the top of recent children's books about bees. Follow the life of one bee named Apis in this fascinating up-close view of the stages of a honeybee's life. Recommended for ages 6-9.



Turn This Book Into a Beehive!
by Lynn Brunelle

Fun exercises, activities, and illustrations offer a deeper understanding of bee life and bee behavior. You can make a difference in the world by turning parts of the book into a home for Mason bees. Recommended for ages 8 – 12.

... Bee kid's corner

Produced by Kim Lehman -www.kim.lehman.com
www.beeculture.com
October 2021

How to Get a Swarm

By Elora Killenbeck

My dad gets a phone call about a swarm of bees. Me and my dad get our bee suits, the smoker, the ladder, the pole, the bee hive, and the basket. Then we put them in the van and go to get the bees. We use the bee suits to protect us from getting stung. We use the smoker to calm the bees down. We use a pole to attach the basket and hook the branch. We use the ladder to stand on so we can get the bees. We use the bee box for putting the bees in after we get them.

We drive to the place with the swarm. First we set up the ladder. Next we put the pole together. Then we attach the basket to the pole. Next my dad grabs the pole and climbs up the ladder. Then my dad hooks the pole to the branch that has the swarm on it. Next he shakes the branch and the bees fall in the basket. Then we dump the bees in the bee hive and put the lid on. Then we shut the opening. Finally we put the bees in the van and get in and shut the door. Then we bring the bees to our grandma's house and put them in the bee yard. Then we go home and get the family. Then we go to Yia Yia's to get ice cream.

My dad collects the swarms because the bees make honey and they pollinate the flowers and fruits. Bees are good!

Beecome a Bee Buddy

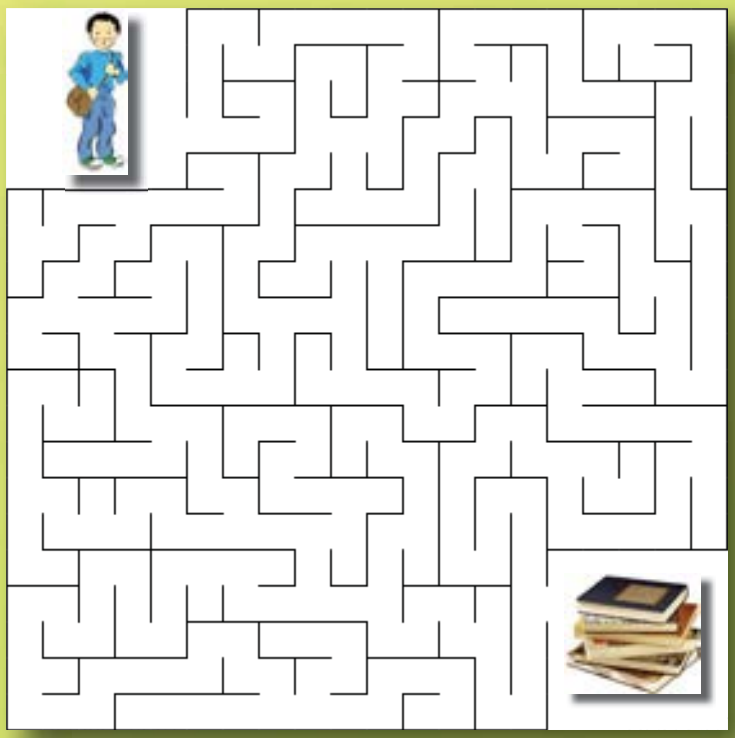
Send two self-addressed stamped envelopes and the following information to: Bee Buddies, PO Box 117, Smithville, TX 78957.

Name
Address
Age
Birthday Month
E-mail (optional)

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

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

Find Your Way to the Library



Write Your Own Book

1. Write a story.
It could be a true story about something that happened to you or someone you know like Elora's story above.....It could be a nonfiction book. Write about the life cycle of a bee. How is honey made? What is pollination?.....It could be a totally made up story from your imagination. Something just for fun! Why do bees buzz? What would happen if a bee can't find her way home?

2. Illustrate your book.
Draw pictures or take photos to go along with the words of your book.

3. Publish it!
Either create a book using an online service like Shutterfly or make and bind your own books.

Be Sure And Check Your Mailing Label. It Will Tell You How Many Issues Of Bee Culture You Have Left! You Don't Want To Miss A Single One

Rooftop Beekeeping – Should You Try It?

Carleigh **Turner**

Walking on the rooftop of a building, you might expect to see a pool, a garden, or just a barren urban landscape. However, an increasing number of buildings have welcomed another addition to their rooftops: Beehives.

If you were to go to the rooftops of buildings such as the World Wildlife Foundation headquarters, you would see plenty of happy pollinators going about their day. And while just being a good environmental contribution, rooftop beekeeping has been especially attractive to beekeepers. Rooftop hives are known to be less likely to incur hive beetles and ants, common pests that are known to completely decimate hives (**www.beekeepinglikeagirl.com**). They are also a great option if you are concerned about having bees too close to anxious/allergic neighbors. However, not everyone is so thrilled about this new phenomenon.

While rooftop beekeeping can be a rewarding, fruitful, and bee-friendly experience, some experts are concerned about its effect on native bee populations (**www.wired.com**). The increase in urbanization of "soil sealing" through concrete has negatively impacted beekeepers worldwide (Daniels, B., Jedamski, J., Ottermanns, R., & Ross-Nickoll, M. 2020). Bees need access to flowers, as they require their nectar and pollen to survive, and with approximately 48 million acres of asphalt in the U.S., bees are definitely feeling its effects. This lack of resources may contribute to a drop in honey production that may be undesirable to beekeepers. Another issue that may arise when rooftop beekeeping is the increased likelihood of hives contracting diseases such as varroa mites and American foulbrood (**www.beekeepclub.com**).

As a rooftop beekeeper myself, I can attest to a few of these benefits and concerns, and I can offer you what I have learned. The following is what I am doing to keep my hives healthy and safe while enjoying the majestic views and wonders of urban beekeeping.

Limited Greenspace and Water Access

In regards to limited greenspace. I am lucky that the hive I am caring for is near a forest with plenty of nectar/pollen sources available. Therefore, when choosing a place to keep your bees, I would either add some green space to the roof (rooftop garden) or ensure your hive is in a location where your bees would have access (within 3 miles) to nectar/pollen sources. For me, the biggest issue is finding a reliable water source. Therefore, it is important to set up some sort of "bee watering hole" where they can drink, as rooftops are notorious for being especially hot.

Increased Likelihood of Diseases and Viruses

I have had much luck with fending off diseases/viruses, just with treating with oxalic acid and regular monitoring. Therefore, regular monitoring of hive health (looking for signs of American Foulbrood, Deformed Wing Virus, etc.,), conducting regular mite counts, and utilizing treatments such as oxalic acid are ways you can combat the increased likelihood of contracting diseases and viruses.

Difficulty Accessing the Hive

Firstly, access to the hives is of the utmost importance. It is essential for you to easily get up to your bees, as it is recommended to inspect your hives every two weeks (especially when nectar flow is on). You will also need to haul heavy equipment to the roof and to the ground and vice versa, which has become an issue for me in the past. Obtaining a hive lift, and working with the building's operators for the best times to work with your bees are some of the best things you can do concerning access to your hives.

So, back to the beginning. Should you try rooftop beekeeping? I have to say it has been one of the most

Another perk of rooftop beekeeping is the incredible view. The top photograph is showing the scenery from rooftop hives at the World Wildlife Foundation in Washington, DC.

Rooftop beekeeping in an urban environment, does not mean you won't get honey. If provided enough green space, honey bees are able to produce a significant amount. Here, a beekeeper is showing a full frame of honey from their rooftop hive.

A rooftop beekeeper does one last check before the sun sets in Washington, DC.

rewarding practices I have ever participated in. And while I have definitely had my challenges, I truly believe that if you think it through, and make sure your hives have plenty of access to green spaces/water, you have access to the hive, and you are regularly monitoring for viruses/diseases, you will come out on top.

Good luck, and happy beekeeping. BC

References

Daniels, B., Jedamski, J., Ottermanns, R., & Ross-Nickoll, M. (2020). A "plan bee" for cities: Pollinator diversity and plant-pollinator interactions in urban green spaces. *PloS one*, *15*(7), e0235492. **https://doi.org/10.1371/journal.pone.0235492**

https://beekeepinglikeagirl.com/the-pros-and-cons-of-rooftop-hives/#:~:text=Rooftop%20beehives%20will%20also%20have,is%20no%20longer%20an%20issue.

https://www.wired.com/story/why-some-ecologists-worry-about-rooftop-honey-bee-programs/

https://beekeepclub.com/getting-started-beekeeping/urban-beekeeping/

Apiary Inspection Indiana

Kathleen **Prough**

There is one inspector for the entire state and apiary registration is not mandatory. There are approximately eight commercial beekeepers and 6,000 sideline/hobby beekeepers. Most beekeepers are found in northern Indiana but recently there has been an increase in beekeeper numbers in the central and southern portion of the state. Indiana is up to 28 local clubs. The state apiary inspector gives presentations at club meetings on pest and disease, hive production, and seasonal management. She also often speaks at the Beekeepers of Indiana meetings. The apiary program inspects some commercial beekeepers for movement out of the state, but most inspections are small scale beekeepers with less than 20 hives. There is no charge for an apiary inspection. Packaged bees, queens, nucs and bee hives are required to be inspected in the state of origin and fill out paperwork to receive a permit to enter the state.

Several crops in Indiana require pollination services, including melons grown in the southwestern part of the state, high bush blueberries and pickles in the northern part of the state, and fruit trees and squash throughout the state.

Honey crops are black locust and basswood in the Spring. Peppermint and spearmint fields in northern Indiana during the Summer. Clover and wildflowers throughout the state. The main nectar flow is May through June. Dearth period in July. August and September may be able to get some aster and goldenrod honey. This can be spotty depending on how much rain we get. The average is 60 to 80 pounds of honey per hive. BC

BIP Tips

Anne Marie **Fauvel** & Dan **Wyns**

Looking For Signs Of Varroa Mites

August is *Varroa* month at Bee Informed Partnership (BIP). The BIP Field Specialists collectively inspect and sample close to 10,000 colonies across the country each year. This month, the Field Specialists will be busy sampling colonies in commercial operations at the tail end of the honey flow, and before fall *Varroa* treatments. This visit is meant to assess general colony health and *Varroa* loads before treatment, which will in turn, be the baseline needed to evaluate the efficacy of the subsequent interventions. One of the most important lessons I have learned in my late Summer trips accompanying the Field Specialists, is how to recognize signs of mite pressure without actually seeing mites themselves.

A brief review of the *Varroa* life cycle helps to explain some of the visual indicators of growing mite pressure. A mature *Varroa* female mite, called the foundress, enters a worker or drone larval cell just before capping. Once the capping is in place, the foundress will attach to the larva, feed on its fat body (Ramsey et al., 2018) and starts to reproduce. The first egg she lays is a male, and all the subsequent eggs laid every few days will develop into female mites. The newborn sisters will mate with their brother and mature into new fertile *Varroa* mites, ready to repeat the process as foundresses themselves. There are therefore two distinct phases for *Varroa*, the time they spend under the capping in the brood and the transit period they spend on adult bees in the colony. This means that for every mite on an adult bee, many more can be found in the brood under the cappings.

Varroa *mite life cycle. Graphic design by Anne Turnham, University of Minnesota Bee Squad.*

The More Evident Signs of *Varroa* Presence

Visual Identification of Varroa on Adult Bees

I have met many beekeepers that rely on visual identification of *Varroa* mites on adult bees as a way to monitor. Although it is true that some mites may be found on the dorsal side (top) of a worker bee's thorax, this usually happens to a noticeable degree in the very advanced stages of mite infestation, when mites are ready to hitch a ride out of the colony to go infest other colonies. Contrary to popular belief, the most prevalent location of mites on adult bees, is found on the ventral side (bottom) of the bee's abdomen, between overlapping abdominal plates (Ramsey et al. 2018). On my first sampling trips a few years ago, I observed Field Specialists picking up worker bees by the base of their wings to look at their underbelly. I had never seen anyone do this during a colony inspection before, but I now routinely pick up bees to look at their abdomen as one of the signs of *Varroa* presence.

For every phoretic mite (top) that can be seen on the thorax there are many more mites feeding on the abdomen (right) which cannot be seen during routine inspections, therefore visually inspecting for Varroa is not a reliable method to detect Varroa *infestations before they reach damaging levels.* Photo Credit: Dan Wyns (top) & Ben Sallmann (right), Bee Informed Partnership.

Drone brood inspection

Developing drones take a few extra days under the capping, which give the *Varroa* foundress the advantage of more progeny reaching maturity. For this reason, drone brood is often a good place to find mites. Drone brood is often exposed when breaking up two brood boxes for inspection and it is good practice to carefully examine any drone cells that are torn open while carrying out routine colony inspection.

Finding mites on adult bee abdomens and in drone brood is interesting and useful information in the big *Varroa* picture, it tells you that you have mites, which is

Drone brood that is exposed when separating boxes provides a good opportunity to look for mites. Photo Credit: Dan Wyns, Bee Informed Partnership.

not very surprising. What it doesn't tell you is how many mites you have. It is important to quantify the infestation level by performing a tried and true monitoring technique. The BIP Field Specialists use alcohol washes exclusively and our data shows that we recover over 95% of mites with this method in the field compared to the standard laboratory methods.

Deformed Wing Virus (DWV)

Varroa destructor itself is detrimental to honey bees, but more importantly, the viruses they transmit are by far more damaging to overall colony health. Unfortunately, most viruses are not associated with any discernable visual signs, and without a molecular analysis of bees, it is difficult to diagnose presence and severity of viral infections. There are a few exceptions, including the more obvious Deformed Wing Virus (DWV) and its variants leaving bees with non-functional atrophied wings in the late stages of infection. DWV has been shown to be transmitted from *Varroa* mites and horizontally, from bee to bee through feeding and cannibalism (Posada-Florez et al. 2021).

Seeing a significant number of bees with deformed wings in a colony is a likely indication that the colony has been suffering from high mite pressure for a sustained period. When this is observed late in the season it is often an indication that the colony has a slim chance of recovering and surviving the winter even if the mite infestation is controlled effectively and quickly.

It is normal to see a few dead bees in front of colonies but if there are larger numbers accumulated including some with deformed wings it can indicate that the colony is collapsing from Varroa and associated viruses. Photo Credit: Dan Wyns, Bee Informed Partnership

Mite Frass

When *Varroa* feeds on pupae under the capping, they produce an excretory by-product which dries up to leave a crystal-like deposit on the roof of the cell. These deposits can be easily spotted when a frame is angled to reveal the upper portion of the cells. The presence of mite frass indicates mites have been present in those cells.

Varroa *frass in many cells in addition to some partially removed pupae indicate high mite levels in this colony.* Photo Credit: Dan Wyns, Bee Informed Partnership

The More Subtle Signs of *Varroa* Presence and Damage (in brood)

Brood Pattern Quality

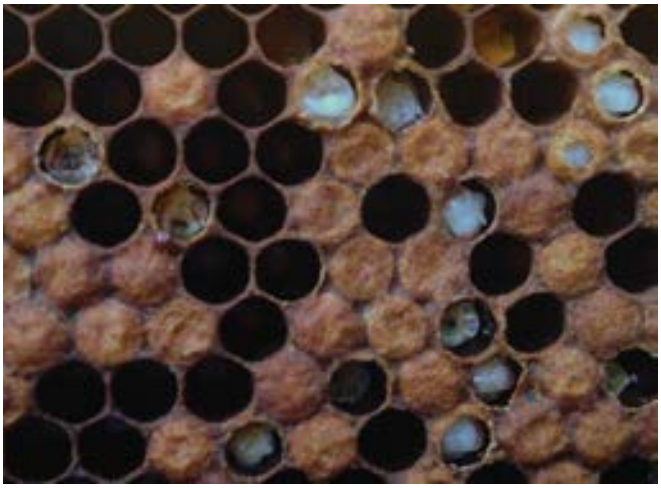
One measure of colony health is the quality of a colony's brood pattern. BIP Field Specialists and sentinel participants are asked to record brood pattern on a scale of 1 to 5, 1 being the poorest (most spotty) and 5 the best (most solid). A brood pattern consistently (on multiple frames) below a 3 may indicate a great many things, including queen failure or potential diseases including advanced stages of *Varroa* infestation. Therefore, a patchy brood pattern is often the first clue that something is not quite right in the colony and a solid invitation to look further down into the cells to hunt for other clues.

Often, the empty cells in a brood pattern are a result of the honey bees' hygienic behaviors. Some colonies strongly exhibit the hygienic trait that allows them to detect maladies, including mites under the cap. By detecting *Varroa* and removing the infested pupa the *Varroa* reproductive success is diminished. Hygienic behavior may therefore result in a somewhat more open pattern but can be overall beneficial in slowing the *Varroa* population growth within the colony. This is the reason why a score of 4 on a brood pattern can be good news.

Example of brood pattern scores of 1, 3, 5. Photo Credit: Robert Snyder, Bee Informed Partnership

Chewed Down Brood

Too often, bees cannot keep up with the *Varroa* population growth in the colony. As the *Varroa* infestation level rises in the colony, so does the visual evidence of the hygienic behavior response and the brood pattern score plummets as bees try in vain to rid themselves of the parasites by removing and increasing percentage of developing pupae. Bees start this process by poking a hole in the pupal cap, which halts the bee development and stops the mite's reproductive cycle. Furthermore, honey bees will continue the opening of the cap process and remove the pupae, often by chewing it in pieces, a phenomenon we describe as Chewed Down Brood (CDB).



The presence of many pupae in various states of removal and mites on the comb indicate that this colony is carrying a high mite load. Photo Credit: Dan Wyns, Bee Informed Partnership

Melted Down Larvae

As honey bees continue to work overtime to clean up mite infested cells and the number of emerging bees declines, there is a lack of healthy nurse bees to care for the new up coming brood. Larvae are not fed and cared for properly and this leads to premature larval death. As they decompose they often dry and flatten into blobs on the floor of the cells we call 'melted down larvae'.

Note how these cells have more of a melted appearance without discernable body parts distinguishing them from the chewed pupae, they can look differently as they decompose. Photo Credit: Dan Wyns, Bee Informed Partnership

Caution

After my first few trips with the Field Specialists, I started seeing all these signs of diseases in my own colonies and got myself in quite a panic. In subsequent trips, I tempered my zealous findings and learned two important lessons: 1) Each of these signs of *Varroa* damage in isolation may mean something different or nothing at all. For example, a score of 2 on a brood pattern may point to a declining queen or nutritional stress. Melted Down Larvae may be a sign of European Foulbrood. 2) The intensity with which these signs present themselves is a better indicator of infestation levels. For example, a few chewed down pupae may be the signs of a good hygienic colony. Our Field Specialists quantify their observations such as 0-5 cells (per side of a brood frame) is considered low, 6-20 cells is moderate and 20 + cells is a sign of severe infestation.

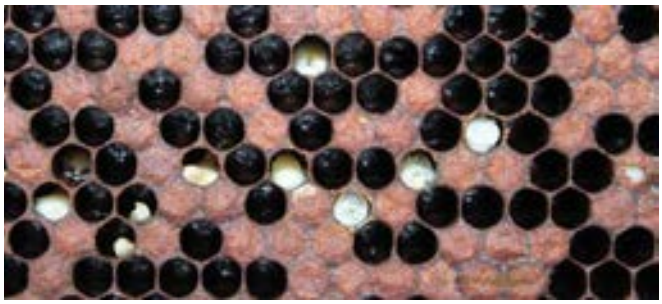
Parasitic Mite Syndrome (PMS)

According to the Oxford dictionary, a syndrome is defined as a group of signs/symptoms which consistently occur together. Parasitic mite syndrome (PMS) would then be used to describe a colony that displays three or more signs described above. For example, if I see mites on adult bee abdomens, some bees with deformed wings along with a score of 2.5 brood pattern, some chewed down brood and a few melted down larvae, I would feel confident in stating that my colony has PMS. This syndrome is an indicator of long-term impact of *Varroa* infestation and the associated viruses they transmit and usually occurs after months

of *Varroa* pressure without successful intervention. For this reason, PMS tends to be more prevalent in the Fall.

Summary

Learning to recognize some of these signs of *Varroa* mite pressure and damage should help supplement your monitoring efforts. If you miss some of the early signs and are seeing the indicators of more advanced infestations, intervening will not necessarily save the colony, as too much damage may have already occurred. However, intervening, even at a late stage has two extremely useful purposes. The first is to take action to prevent spreading all these *Varroa* mites to other colonies as it collapses. And second, is that it will enforce the need for more vigilant monitoring and intervention in subsequent years. BC



Classic Parasitic Mite Syndrome signs, complete with mite frass, uncapping, Chewed Down Brood, Melted Larvae and visual identification of mites.
Photo Credit: Robert Snyder, Bee Informed Partnership

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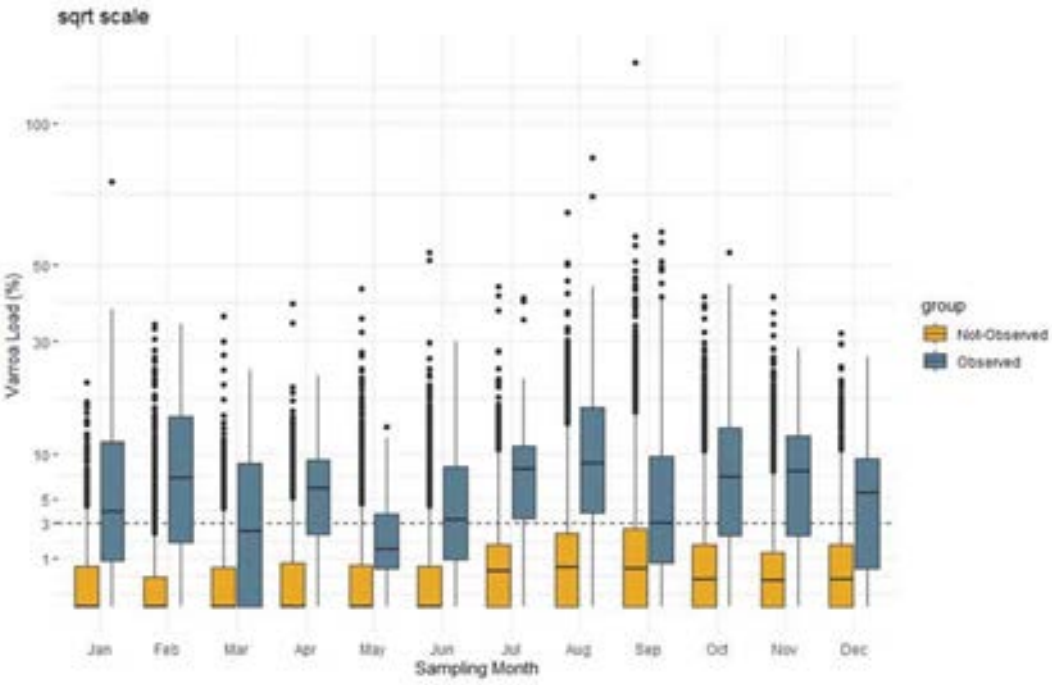
The boxes represent 75% of the data in both colonies in which PMS was (blue) and was not (orange) observed. Note that most of the colonies in which PMS was not observed occurred under the 3% Varroa *infestation threshold. In contrast, colonies in which PMS was observed showed higher Varroa loads, frequently above the threshold. You can also observe a seasonal trend with higher incidence in the fall months and again after the Winter (January and February data come from commercial colonies in California Almonds).*



A Glance At The Oldest Egyptian Beehives

Hossam **Abou-Shaara**[1]
Dahi **Mohamed**[2]

Beekeeping is an old practice in Egypt since the time of Pharaohs. The ancient Egyptians used mud hives to keep honey bees. Nowadays, modern Langstroth beehives are being used all over Egypt except a few locations in South Egypt where mud hives are still used. This article presents a close up with the mud hives (the historic beehives of the ancient Egyptian). It is well known that Egypt is among the oldest countries in beekeeping and the ancient Egyptians were able to keep bees to harvest honey, and they were able to perform migratory beekeeping across the Nile River. The majority of beekeepers saw drawings of the mud hives without getting a chance to see these hives in reality. Therefore, this article is interesting to increase the knowledge of beekeepers about ancient beekeeping in Egypt.

Figure 1. *Locations of the mud beehives in Asyut marked with blue signs (Google Earth images).*

Figure 2. *Apiary contains mud beehives.*

Figure 3. *The arrangement of beehives above each other.*

The mud beehives

The mud beehives exist in Asyut Governorate towards South Egypt. Approximately three locations only still have these beehives (Fig. 1). These locations are close to cultivated lands. The rest of the country has modern beekeeping using Langstroth beehives (beehives with movable frames).

The apiary contains hundreds of mud hives (Fig. 2). These beehives are arranged above each other in an organized manner. Each set of beehives can be up to 400 mud beehives. The mud beehives are fixed close to each other using mud (Fig. 3). The length of a mud hive is about 48" with diameter of 8".

Each beehive is closed using a mud cover (Fig. 4). Each cover contains a small hole to allow entry. The honey is harvested from the back side of the hives.

Typically the bees build small wax combs inside the hives (Fig. 5), and store honey in the back combs. There are some tools which are used to remove the covers or to collect the honey from the beehives (Fig. 6). Bees are able to live inside these beehives all year without any problems during Winter/Summer seasons. In case of swarming, the bees can enter any empty tube to build their own new colony.

This article presents a glance of the oldest beehive types in the world (the mud hives). Without doubt, the current beehives with movable frames are better than such historic beehives. However, mud hives give a chance for beekeepers/students/researchers to follow the natural behaviors of bees without human interference. Also, locations containing mud hives are a good destination for apitourism in Egypt.

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Figure 4. *The entrance of the mud beehives.*

Figure 5. *Combs and bees inside the beehives.*

Figure 6. *Dr. Dahi collects a sample of bee workers (left) and shows two tools useful for working with mud hives (right).*

BC

How To Thrive In Pandemic Times

Lessons From The Honey Bee

Dalial **Freitak**

With an ongoing pandemic, many of us are searching for answers on how to deal with such a unique and unnerving situation staring us in the face every day. Because of the nature of my work as a virologist, previously developing human vaccines and now as a honey bee virologist, I often compare humans to other organisms with respect to how they combat diseases and fend off pathogens. Bees have been around for much longer than humans; I consider them to be the more adept of the two with more experience navigating the natural world.

Modern humans evolved around 100,000 years ago and established societies roughly four to 10 thousand years ago. In contrast, honey bees evolved much earlier, around 100 million years ago, and established societies around 50 million years ago. During this time, honey bees faced an onslaught of challenges from the natural world, affording them the time to acquire an effective response to highly infectious microorganisms. Studying the long-acquired defense mechanisms of the honey bee may offer critical strategies for overcoming infectious diseases as a society.

In both human and honey bee species, defense mechanisms can be separated into two categories: social immunity (mounting anti-parasitic behaviors for the benefits of the group rather than the individual), and individual immunity (mounting an immune response to combat invading microorganisms within an organism).

Social immunity

In honey bees, social immunity is comprised of numerous and complex behaviors. Polyandry, where a single queen will mate with multiple drones, expands the genetic diversity within a colony. Task allocation minimizes pathogen transmission by reducing the contact between highly exposed individuals (e.g. foragers) and lesser exposed individuals (e.g. larvae, pupae, and nurse bees). Resin (propolis) is an antimicrobial agent. And allogrooming, reciprocal grooming by bees in the hive, removes parasites and pathogens. These, in combination with hygienic behavior (maintaining cleanliness and health), social fever (whereby many bees raise the temperature to kill bacterial invaders), and absconding behavior (where most of the bees leave the hive along with the queen) help to protect the honey bee.

Human behaviors, with respect to social immunity, can be equivocal to those found in honey bee society. For example, genetic diversity is an important factor in the survivorship of both bees and humans, although the mechanism generating diversity in humans is quite different. Research shows that high genetic diversity within a honey bee colony makes it more resistant to infectious disease[1]. In humans, genetic diversity is also correlated with improved overall health as well as the ability to fight diseases. A well-known example of this is the effect of inbreeding in a society where the resulting decreased genetic diversity was found to reduce fertility[2].

Another example of similarities between bees and humans is the ability to self-medicate. Honey bees collect resin from trees (propolis) and harness its antibiotic properties for use in the hive. The honey bee gut pathogen *Nosema ceranae* is significantly less infectious to bees after consumption of propolis extract[3]. Humans further developed on this premise, using research to isolate and synthesize beneficial compounds for use in medications.

Other similarities are more obvious. For example, honey bee grooming is analogous to good hygiene practices in humans. The ability of honey bees to identify and clean infected/unhealthy larvae is similar to doctors detecting and preventing disease, and isolating infected individuals to prevent any further spread.

From a social point of view, the main components honey bees use to fight an epidemic are logical: (i) keep things clean; (ii) identify and isolate infected individuals away from healthy ones; and, perhaps less obvious, (iii) maintain a genetically diverse society.

Individual immunity

The insect and mammalian innate immune systems consist of both humoral and cellular responses. Both are activated by the presence of an intruder, as well as the metabolic molecules resulting from the invader's replication inside the body, or from wounding.

The cellular response, as the name implies, utilizes cells to perform the defensive tasks. Some examples of this include: Encapsulation, the process whereby a pathogen is aggregated by several cells. These cells are called hemocytes in the case of insects and myeloid cells in mammals. And Phagocytosis, whereby specific hemocytes in insects and myeloid cells in mammals "swallow" the pathogen and destroy it. Insect hemocytes display many structural and functional similarities to human neutrophils (a myeloid cell).

The humoral response takes place in extracellular fluids secreted by special cells. It has this name because it involves substances found in the humors (body fluids). Many of the humoral responses in insects and mammals are similar); however, a number show distinct differences. For example, in mammals, melanization (skin pigment) plays a role in protection from the sun. In contrast, insect melanization acts as a defense mechanism in which the phenyl oxidase (proPO) system is activated upon pathogen invasion. Human and insect antimicrobial peptides (AMPs) share distinct structural and functional similarities. Insects produce the majority of their AMPs from the fat body while mammals rely on production locally at the site of infection by epithelial/mucosal cells.

Perhaps the most provocative part of this story is the realization

that, despite there being many similarities between insect and mammalian immune systems, there was thought to be one exception. Mammals possess an adaptive immune system. The adaptive immune system enables a response to a specific pathogen. It relies upon the presence of a host lymphocyte with specific receptors that recognize the precise pathogenic antigen. The adaptive immune system has the ability to remember previous pathogen attacks, resulting in a more effective immune response to subsequent infection. The ability to train the immune system to quickly mount an attack when faced with a previously encountered threat is the basis for one of the biggest revolutions in human medicine: the vaccine.

Do insects lack an adaptive immune system? This is a question that has been around for decades. Social insects, including the honey bee, *Apis mellifera*, display immunological priming. Prior exposure to a pathogen enhances survival to subsequent attacks as a result of increased humoral and cellular responses.

Trans-generational immune priming (TGIP) in honey bees is a remarkable finding. It demonstrates the existence of a system able to acquire and transmit some level of protection to the offspring. The remaining question is how. What are the molecular mechanisms behind such an intriguing defense system? And more importantly, what can we learn from this?

In 2015, researchers from Finland began elucidating this puzzle by showing that Vitellogenin, a nutritious lipoprotein synthesized by the fat body, plays a role in TGIP[4]. Vitellogenin has several functions in the honey bee body, including a role in the recognition of pathogens. It has been shown to be a transporter of small fragments of processed pathogens into the eggs of the honey bees, possibly to confer resistance to future pathogenic attacks.

It is true that insects lack antibodies, the carriers of immunological memory that human mothers transfer to their offspring; however, it would not be surprising if honey bees could have alternative methods to pass along the same benefits to their young using similar techniques. The advancement of such a discovery could bring the first honey bee vaccine to the market, disproving one of the assumed fundamental differences between the immune system of humans and honey bees. I am very excited to see what new discoveries will bring to the industry to help honey bees and beekeepers alike. BC

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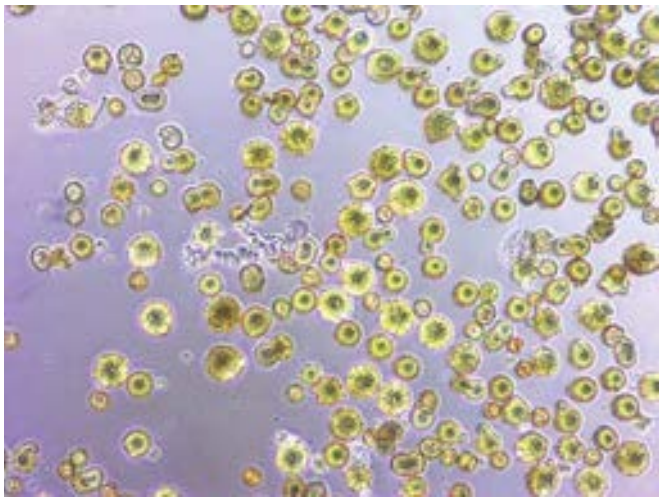


Common Floral Bacteria

It can induce pollen germination

Shawn **Christensen,** UC Davis

Certain species of floral bacteria can enhance pollen germination, according to a study published from the University of California, Davis in the journal *Current Biology*. "This is the first paper documenting stimulation of pollen germination by non-plants," said first author Shawn Christensen, a doctoral candidate in associate professor Rachel Vannette's laboratory in the Department of Entomology and Nematology. "Nectar-dwelling *Acinetobacter* bacteria stimulate protein release by inducing pollen to germinate and burst, benefitting *Acinetobacter*."

Acinetobacter is a genus of bacteria very common in flowers. They are usually among the most abundant bacteria in nectar and are often found on other floral tissues, including pollen and stigmas.

The authors collected California poppie from the UC Davis Arboretum and Public Garden, and *Acinetobacter* primarily from nearby Stebbins Cold Canyon Reserve, which is part of the UC Natural Reserve System.

"Despite the essential nutritional role of pollen for bees and other pollinators, we still know very little about how pollen is digested by anything," Christensen said. "We found out that certain bacteria in flowers, *Acinetobacter*, can send a chemical signal to pollen that hijacks its systems and tells it to open the door from the inside – releasing protein and nutrients for the bacteria."

Christensen said the bacteria can double the amount of protein released from pollen. That makes it important for bacterial growth, but it could also be exploited by bees or other pollen consumers to get more nutrition from their food.

The question of how organisms actually eat pollen has been a long-standing one. Pollen is well-protected by layers of resistant biopolymers, and it's unclear how pollen-eaters get through those protective layers.

"The bacteria have found what looks like a fairly unique and very effective way to get nutrients, which are otherwise scarce in a flower environment," said Vannette, a UC Davis Hellman Fellow. "It is a very neat biological trick. This finding opens the door for a lot of exciting new research: How do the bacteria do it? Given that *Acinetobacter* is often found on pollinators, do pollinators benefit from this? Could bacterial action on pollen make it more or less beneficial to pollen-eaters? And what about plants? Could the bacteria be reducing pollination by causing pollen to germinate before fertilization? We aim to investigate many of these possibilities in future work." BC

Honey Processing Equipment Breakeven

David **MacFawn**

How much and when honey-processing equipment should be purchased are things to consider for new and developing honey operations. Decisions are based on the operation's labor rate, the equipment's cost, and honey yield per colony. The higher the labor rate and the lower the equipment's cost, the sooner an investment in honey-processing equipment should be evaluated. Most operations currently guess at when and how much they should invest in honey-processing equipment. Also, a lot of new beekeepers believe that they need to invest in honey-processing equipment upfront.

For beekeepers with under eight to 10 colonies, it is recommended they use either a bee club extractor or get someone with an approved honey facility to extract their honey. This is especially true for new beekeepers who are still learning and deciding if beekeeping is for them. Honey-processing equipment is expensive. If a club extractor or getting someone to extract the honey is not available, then the purchase of some honey-processing equipment is necessary.

If your operation is from 10 to about 40 colonies, an extractor, an uncapping tank, and a bottling bucket are recommended. That is about $1,200 to $1,500 in equipment. If good-quality equipment is purchased initially, it will last a lifetime as long as it is well maintained. A clean and well-maintained extracting building/location is required. Clean hot water to clean the equipment, covered lights, a floor drain, a restroom in close proximity is all important.

Honey is hydroscopic and will absorb moisture. For quality honey that will not spoil, the USDA requires the honey to have 18.6% moisture or less. Buckets (five gallon/60 pounds food grade) with lids are needed to store the honey. A filter is also needed to remove any extraneous wax, bee parts, etc., from the honey. This filter is typically placed on top of the honey storage bucket when the honey drains out of the extractor into the storage bucket. A 60-pound bucket with a honey gate will work for bottling small (200 to 500 pounds) amounts of honey. If you expand to more than 40 colonies and therefore produce more honey, a more expensive honey-bottling tank with a dripless honey gate is in order. A capping's scratcher and uncapping knife are also needed. The scratcher is for uncapping the cells that the uncapping knife misses. The scratcher should be used as little as possible to avoid minute wax particles from getting into the honey. Wax particles result in honey cloudiness and premature granulation. The cappings can be left to drain in the uncapping tank for small amounts of honey extracted, or moved to another bucket, with a honey grate, to drain.

When you start producing more than 1,500 to 2,000 pounds of honey, a more elaborate setup may be used. An uncapper and possibly a capping's spinner is in order, with a water-jacket bottling tank. An uncapper will speed up your honey extracting immensely. A water-jacket bottling tank will ensure your honey does not get too hot. Overheating honey degrades the flavor and nutritional benefits are lost. The honey-processing equipment purchase and expense can be spread out over several years (depreciated). An operation's honey extracting through-put can be sped-up by using two extractors. One extractor is spinning/extracting while the other extractor is being loaded with uncapped frames. This is the computer double buffer memory concept. So, there is a trade-off in cost between extracting speed/labor cost and equipment cost. If the honey-processing equipment is going to be used for years, then it pays to invest in two extractors. Investing in motorized extractors

Equipment cost entries	using Maxant equipment *1					
Maxant equipment	part number	Start up	Hobbyist	Growing *2	Sideliner	Commercial *3
20 frame ext	1400PL		$ -	$ -	$ -	$ 1,700.00
9 frame	3100 P	$ 950.00	$ 950.00		$ 950.00	
spinner	1200JR				$ 1,900.00	$ 1,900.00
uncapper	1700mbp		$ -	$ 1,800.00	$ 2,800.00	$ 2,800.00
uncapper tank	1800tank	$ 450.00	$ 450.00	$ 450.00	$ 450.00	$ 450.00
uncapper tank	MUTT			$ 950.00	$ 950.00	$ 950.00
clarifier	300-36-16gal			$ 1,500.00	$ 1,500.00	$ 1,500.00
bottler	600#25gal		$ 1,500.00	$ 1,500.00	$ 1,500.00	$ 1,500.00
Pail Pal with Filter Bag		$ 110.00	$ 110.00	$ 110.00	$ 110.00	$ 110.00
Total		$ 1,510.00	$ 3,010.00	$ 7,310.00	$10,160.00	$ 10,910.00

*1 = less expensive equipment can be procured, this is an example

*2 = growing business already has an extractor

*3 = large beekeepers avg is 0.1 extractor slots/hive

To recoup equipment cost	labor rate	yield/hive lb
	$ 12.00	60

$ equip cost/ $ per hr labor rate=hrs	hrs usage to break even	126	261	609	847	909
hrs / yld colonies / med super per col / 8 supers per hr	# of supers reqd to break even processing 8 supers per hour@7.5 min/super	9	18	44	62	66
hrs / yld colonies / med super per col / 12 supers per hr	# of supers reqd to break even processing 12 supers per hour@ 5 min/super	6	12	30	41	44.20

Assume:
medium super = 34#
barrel = 700#

is recommended. Motorized extractors are easier to use and will speed-up the extracting operation.

Equipment Cost Entries. The reader is referred to: **http://www.maxantindustries.com/**

The spreadsheet starts with five different possible scenarios (Start up, Hobbyist, Growing, Sideliner, Commercial) depending on where the beekeeper is at in their company's development. When starting, you only need an extractor, uncapping tank, and filter. As you increase your operation, more equipment can be added.

In the spreadsheet analysis, the total equipment cost is determined. The hours' usage to break even is determined by taking the total equipment cost in dollars and dividing by the labor rate in $/hours. The hours' usage to break even is then divided by the yield per colony divided by the amount of honey per medium super times the number of supers extracted per hour which gives you yielding supers for equipment break-even. Various equipment configuration costs can be examined with the number of supers extracted per hour being varied based on if you have two extractors (one extractor extracting while the other extractor is being loaded) and an uncapper. A mechanical uncapper will speed up the uncapping process immensely.

Financing honey-processing equipment may be an issue. If the operation does not have the cash on hand, consider a loan, depending on the interest rate and amount. An amount of $7,000 to $10,000 may be in order depending on the revenue the operation has. The bank will determine the operation's debt to equity ratios and other ratios. The operation may have to purchase the equipment incrementally. After the extractor, a bottler and uncapper are the most critical pieces of equipment. Also, purchasing used equipment is an option that may be in order if you can find it. A big issue is having a honey-processing building or location to process the honey. Often a garage or other building/facility can be converted to a honey-processing building. The financial numbers need to be analyzed to determine what the operation can afford. Analyzing the financial numbers is critically important.

When analyzing the financial numbers, the risks need to be evaluated honestly. Things such as how well the operation is at keeping its bees alive and their honey yield maximized are critical. Transportation, feed, medication, and labor costs must be considered. These costs should be analyzed in relation to one another, not independently. Changing one cost may impact another variable/cost. The operation should typically start small and close to home before expanding. With bees, you need to understand the business very well to be successful. This takes practice, education, and communication with experienced beekeepers in addition to book learning.

Usually, for local honey, there are no issues moving and selling the product. Word-of-mouth sales and selling at the local farmers' market work well. You need to decide what type of jar and label you will use. The jar and label will be determined by your venue and customer base. You also need to determine if you will use plastic or glass jars.

To be successful with a honey operation, the personnel need experience and book learning. Going with the bee biology, instincts, and characteristics are critical for success. You need to go *with* the bees' instincts and not against them. The operation should not expand exponentially but should expand incrementally. If under eight to ten colonies, the operation should consider paying someone else or using bee club equipment to extract their honey. As the operation grows, more honey-processing equipment can be added. BC

David MacFawn (***dmacfawn@aol.com***) *is an Eastern Apiculture Society Master Beekeeper and a North Carolina Master Craftsman beekeeper living in the Columbia, South Carolina, area. He is the author of three books,* **Applied Beekeeping in the United States by David MacFawn, published by Outskirts Press https://outskirtspress.com/**

We Can't Always Choose The Music Life Plays For Us, But We Can Choose How We Dance To It

IS GALVANIZED METAL SAFE TO USE WITH HONEY?

Leonard **Riepenhoff**

Does honey contain enough acid to remove zinc from galvanized sheet metal which could be unhealthy?

The internet says **don't store honey in galvanized containers.**

No problem since we generally store honey in glass or plastic.

But is it unhealthy to use a honey extractor or a solar oven made with galvanized sheet metal?

Do this test, then you decide.

The acidity on a PH scale measures from 1 to 14, with 7 being neutral and 1 being the most acidic.

Honey ranges from a PH 3.4 to 6.1. Lemon juice has a PH of 2 to 3.

Honey and lemon juice left separated on a piece of galvanized sheet metal overnight, then rinsed clean with water left the following results:

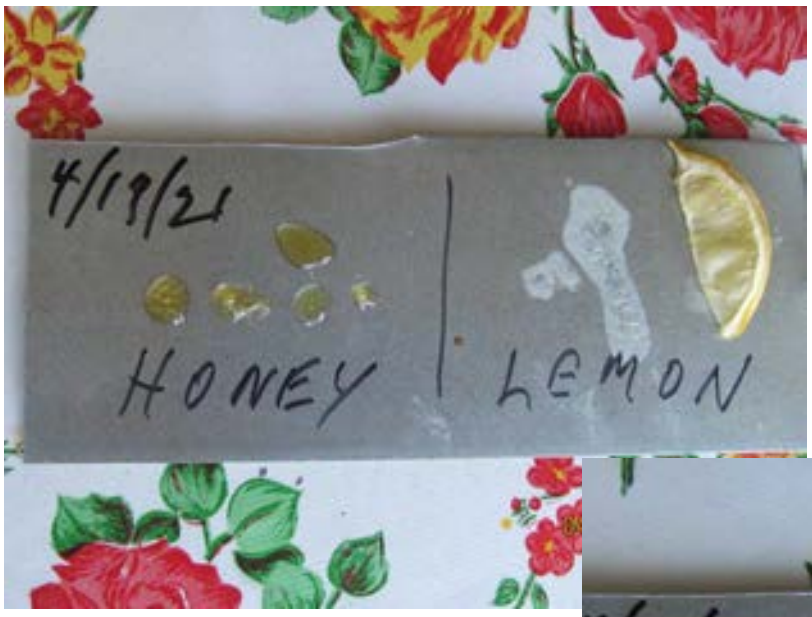
Where the lemon juice was shows some obvious discoloring (deterioration?), where the honey was there was no noticeable visual change.

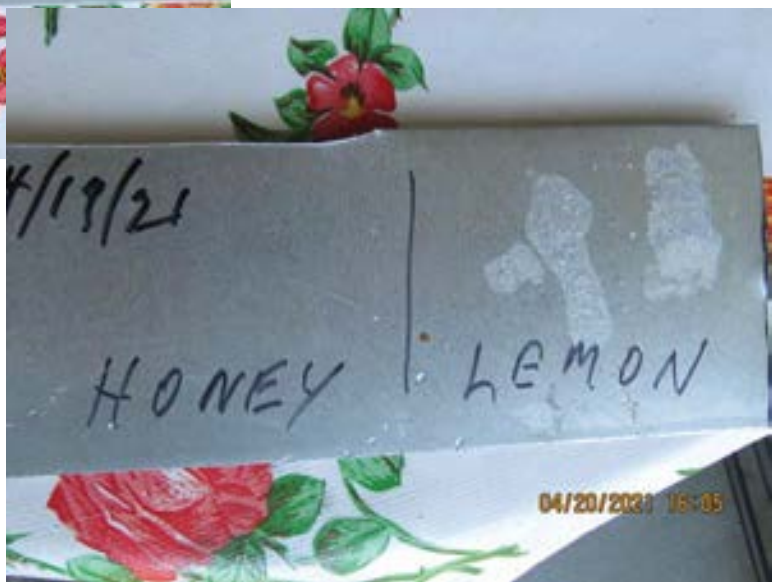
When using a **galvanized honey extractor** or a **solar oven**, the honey is in contact with the galvanized metal for only a short time before it runs into a container that isn't metal, then short-term exposure of honey on galvanized sheet metal honey extractors or solar ovens would be even less.

Just don't store it in a galvanized container.

You can purchase zinc tablets at a health food store, if you require zinc, don't rely on your bee equipment.

I Have used a **galvanized honey extractor** for years, and **a full frame solar oven extractor** made with galvanized sheet metal (which is available on "Craigs List"). My honey has won best of show three years in a row at our Sonoma County fair in California. BC





The Happy, Sad Days Of Late Summer, 2021

It's ending.

Yep, for me, the 2021 season is ending. Yes, there will still be some late season flowering action from fall flowers such as goldenrod and asters, but I find that those late season plants are like some people, who after eating a full dinner, are asked if they want dessert. They reply with something like, *"I am sooo full – but maybe just a bite or two of that Dutch Apple pie with some vanilla ice cream."* For my bees and me, the full nectar meal of 2021 was presented several months ago and now the seasonal fall flowers are equivalent to, *"Just a bite or two of some pie."* So, for me and my bees, the 2021 season is ending. It will have been an *"okay"* year.

Ergo, the sad, happy days of late Summer

At this very moment, the sky is blue with hither/yon fluffy clouds being stirred by a warm breeze. *(I'm not making this up. It really is.)* A little house wren that is not much larger than my thumb, is making more sound than birds 10 times its size. Plants are green and leafed out. But what blossoms remain are really showing their age. Spring 2021 is dead and gone, and Summer is aging – but it's aging nicely. Today is a nice day, but I'm somewhat sad to know that the Summer season must end.

But here's a quirk

While these plants and their blossoms are clearly senescencing, until fall flowers arrive, other than robbing each other, these waning plants are all that's left for bees' forage. I don't know how to best pose the question, but is it possible that blooms that come later in the season get better pollinator attention than blooms in full peak when pollinator attraction competition is keenest? I pose the question because while I was taking these photos, there were abundant pollinators – of multiple species – consistently visiting the same tired, old blooms. Occasionally, there were even what could be called, *pollinator traffic jams*.

Yet another quirk

These aging flower plantings can only be loved by beekeepers and dedicated gardeners. From a manicured landscape view, these aging wildflower plantings look terrible. It would be socially unacceptable to snap a pic of my immediate neighbors' yards, but you just know that they look great. Yes, I feel societal pressure to neaten things up. I'm the guy who is pained and actually slows my mower to allow pollinators to leave the clover blooms so I can mow them down. Odd, isn't it? I nurture plants for my bees, but I cut them down so the place looks neater.

Then there are the invasive plants

During my entire career within the university community, bee activity on invasive plants was always a *minefield* topic. What's an invasive plant? What's a non-native plant? What's a noxious native plant? What is a perfectly accepted native plant that has become a weed by simply being in the wrong place? Yet, every one of these topic areas has passionate supporters who would vilify those who are not on board with their particular philosophy. For all groups within all areas, please know that I have tried to be a good steward of our environment. Most often, I have failed.

Yet, I have done it again. I have a BeeBee tree (apparently *Tetradium daniellii*). I planted it more than 10 – maybe 12 – years ago. The potted seedling had plant contaminants, and I was not sure which was BeeBee plant, and which was not. I planted the entire root-knotted pot and let the plant(s) fend for themselves. Nearly 10 years later, it grew to form an unappealing oversized shrub. Male deer (bucks) have damaged it by using it as a *"buck rub"* to mark their territory. If I struck the shrub with my tractor mower, the limbs

An old forager, on an aging blossom, photographed by an old beekeeper during waning Summer. The cycle of life.

When is this a pollinator food source and when is it blight?

easily broke. It has a terrible grow pattern with intertwining limbs. I cannot explain why I have not pulled it from the ground. On no less than four occasions, I have either made plans to remove the plant or to have it commercially removed. I was not even sure what the plant actually was. Then, in July 2021, it did a very strange thing – for the first time, it flowered. Within the insect world, the word was out. Wasps, bees, flies, moths, and beetles seemingly came from afar to partake in what was actually a very small blossom population. It was truly impressive. This is how bee and insect activity were described by Vincent in the *Michigan Botanist*, 2004.[1]

> *Indeed, when the plants are in flower, an incredible number of bees can be seen (and heard) visiting the flowers. Hayes (1977) describes the tree as valuable for beekeepers because it flowers prolifically from mid-July through mid-August, when little else is blooming. The heavy seed production has been cited as a potential food source for wildlife.*

Yes, after years of being uncertain, it was suddenly very easy to determine that the plant I picked up at a bee meeting more than 10 years ago is, indeed, a BeeBee tree and yes, it is also listed as an invasive plant that should not be propagated. Well, of course, it is![2] That seems to be how life works. This was an incredibly attractive plant to both insects, birds and even deer. So, it's ironic that it should be wrong to plant it.

This admonishment happens so very often. At this point, I fear that I am skirting with frustrating (angering?) people outside of beekeeping who have stronger opinions than I, but it becomes painful to keep having rewarding plants restricted due to undesirable characteristics.

The ostracized plant list is long and complex. Chinese Tallow tree (*Triadica sebifera* (L.) Small), Purple Loosestrife (*Lythrum salicaria*), Autumn Olive (*Elaeagnus umbellate),* the common sweet clovers (*Melilotus sp.), are* highly attractive plants species to honey bees but are on invasive lists. Even beloved Kudzu (*Pueraria montana var. lobata Willd) – the vine that ate the South* - is attractive to honey bees. Hey, don't only blame us. Solitary bees and flies are major pollinators of Garlic Mustard (*Alliaria petiolate),* an aggressive plant that is unwelcomed in North America.

Here's the conundrum – these undesirable plants are not always harmful to pollinators. Indeed, these obnoxious plants are sometimes beneficial food sources for pollinators. In their writings, Vincent and Drossart, et.al, alluded to the uncertainty of harmful effects of invasive species on insect pollinators.

In the Spring flowers are breathtaking.

A bee colony tempest

I do not intentionally propagate non-native or invasive plants. I was blissfully ignorant when I planted the BeeBee tree. As with Chinese Tallow, I thought I was helping my bees. I mean how common is the question, *"What can I plant for bee forage?"* But other than not intentionally planting these undesirable species, I can do nothing. My bees have their own sense. That sense directs them to find food – find it fast – find the most – and defend their reserves mightily. The relationship between pollinator foragers and unloved plant species seems likely to continue for a long time.

On an honest and personal note

Since 1983, in my monthly ramblings, I have more than occasionally referenced my immediate neighbors and their involvement with my bees. Unintentionally, over the years, my neighbors, both near and far, have molded my beekeeping philosophy and colony management abilities. It is rare for me, the beekeeper, when planning my bee management day, not to consider what my neighbors will be doing on that same day. If they are having an outdoor event, it will not be a good day for me to remove honey supers. If they are mowing, I will not spend my time producing a bee video. What my neighbors are doing, determines what I can do with my bees. It has always been that way.

---

[1]Vincent, Michael A. 2004. *Tetradium Daniellii* (*Korean Evodia*; Rutaceae) *As an Escape in North America.* The Michigan Botanist. Vol 43. PP 21-24. **https://quod.lib.umich.edu/cgi/p/pod/dod-idx/tetradium-daniellii-korean-evodia-rutaceae-as-an-escape.**

[2]Drossart, M., Michez, D. & Vanderplanck, M. Invasive plants as potential food resource for native pollinators: A case study with two invasive species and a generalist bumble bee. Sci Rep 7, 16242 (2017). **https://doi.org/10.1038/s41598-017-16054-5**

Foragers on BeeBee Tree.

I would readily argue that those of you with the luxury of not having close neighbors have had a bit less than the full beekeeping experience. Keeping bees without close neighbors could be compared to keeping bees that do not sting. Without neighbors and without stinging bees, the penalty for common beekeeping mistakes is greatly reduced. Neighbors make one become a more finely tuned beekeeper.

If I may, of my many beekeeping/neighbor stories, I would like to retell a short one at this point. One of my two immediate neighbors, who was a bilateral lung transplant recipient, was fulfilling a medical appointment one-hundred miles away in Columbus, Ohio, where he was seeing his doctors for routine reasons. While making chitchat, one of the medical people mentioned that he kept bees. My neighbor and his accompanying wife immediately said that they lived next door to a beekeeper in Wooster – Jim Tew. The medical person said that knew Jim and that he read this very publication, *Bee Culture*, and asked if they were the neighbors that I occasionally mentioned in some of my articles.

I was caught. Yes, I was hopelessly caught. I never, ever dreamed that my neighbor would see the inside of a *Bee Culture* magazine. When they returned home, my neighbors were eager to tell me how small the world is. They were very much interested. As was always the case, he was amused and unoffended. I assured him that he was always mentioned in a positive supportive light. That part was perfectly true.

Sadly, last month on the day of my 73rd birthday, my neighbor passed. We had lived side-by-side for 38 years. He and his family never once – not once – complained about my bees. Not once.

Even other neighbors

Eleven months earlier, during September 2020, my neighbor on the other side of my property passed. We had been neighbors for about 30 years. This neighbor had an interesting history that I have never told you until now. For some vague reason, I was afraid to tell you that while she was living that, in her youth, she was an original *Mouseketeer* and personally knew Walt Disney and all the other beloved cast members. Yes, for a while, she was famous.

Through the years, I had many bee events with Bonni, my neighbor with the connection to *Micky Mouse*. Yes, it's true. She did her part in helping me develop into a more accomplished bee wrangler. My bees' insistence on visiting her bird waterer caused me to develop a life-long interest in bees' water foraging behavior. My bees filling her bird feeders during late Winter and early Spring as they foraged for anything resembling pollen forced me to marvel at honey bees' desperation for protein in early Spring.

Anne, a neighbor one house down, helped finetune my explanation on how ground-nesting yellowjackets were completely different from honey bees. Neighbors have taught me how to make small talk when hiving a swarm on their property. Neighbors have come to me to remove hornet's nests for them. Neighbors have asked to borrow my beekeeping equipment so they could remove their own stinging insect nests. And of course, some neighbors have explained they have life-threatening allergies to bees and are required to take Benadryl® to forestall death. Neighbors add a unique dimension to one's beekeeping endeavor.

An honest and personal note continued

I was just short of a total of seventy years coexisting with my two immediate neighbors. Anne, one house down, has now relocated.

Good fences = good neighbors. I need more fencing.

Readers, I'm starting over. On an honest note, I tell you truly that it is a sobering task, at my current age, to start all over again educating and coaching people who live near my bees and who have no interest in becoming beekeepers themselves. *(Deep sigh at this point)*

I expect some of you are asking, *"Why do you not just find an out-yard apiary and keep bees away from home?"* Done that. I do have an out-yard. I rarely go there. One of my remaining bee interests is bee photography and videography[3]. I want some of my bees near me to set these photos up so I can show them to you in these articles and to support our podcast, *Honey Bee Obscura*. I need all my gear nearby and I need to be able to respond to weather issues. But mostly, I just want some bees close to me. I suppose I will just put up even more fencing. You know about fences and neighbors.

As always...

If any of you have unique neighbor stories, let me hear from you. For those of you without neighbors, I apologize for my ramblings. Change is a common characteristic of life. I need to remember that fact as everything changes all around me. BC

Dr. James E. Tew, Emeritus Faculty, Entomology, The Ohio State University and One Tew Bee, LLC

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http://www.onetew.com

For a short video on **"The Sad, Happy Days of Late Summer, 2021"** and more comments on this month's article, hover your smart device camera over this code....

https://youtu.be/FXI3JqiJ8LI

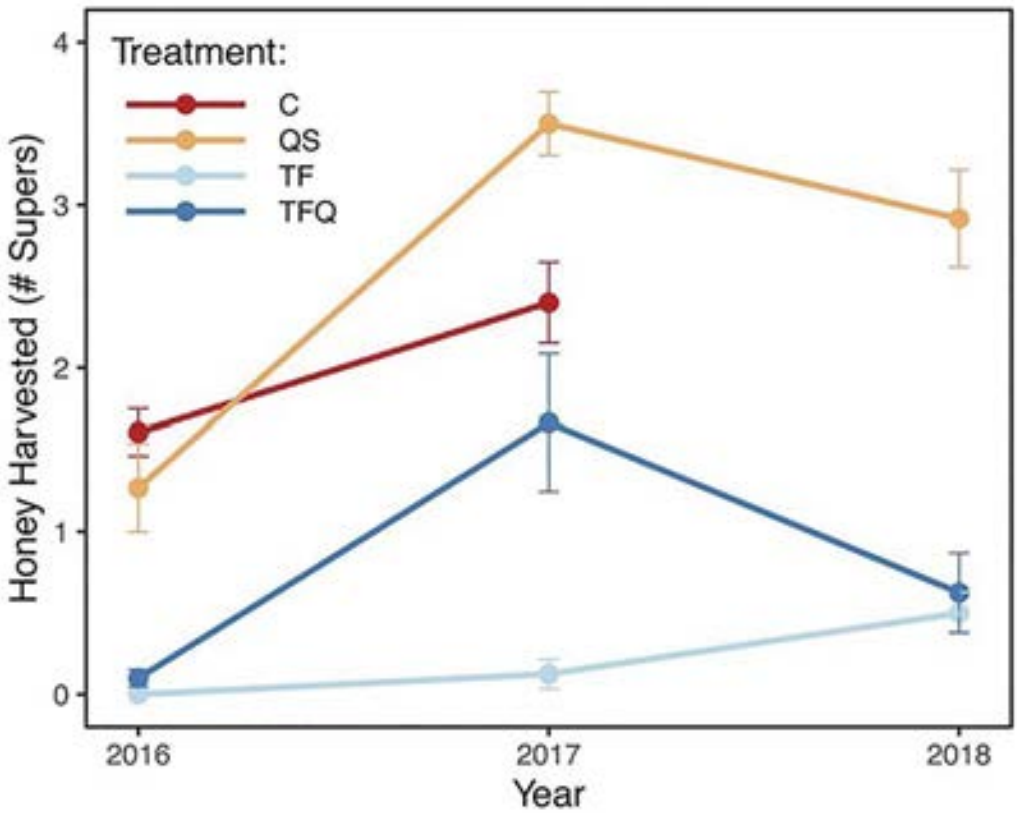
[3]All of my YouTube videos are posted at: https://youtube.com/user/onetewbee/videos

Be Sure And Check Your Mailing Label. It Will Tell You How Many Issues Of Bee Culture You Have Left! You Don't Want To Miss A Single One

Comparison Of Treatment-Free Cultural Controls With Formic Acid *Varroa* Mite (*Varroa destructor*) Treatments In Managed *Apis mellifera* Colonies

Ross **Conrad**

The chart and table below were inadvertently left out of Ross Conrad's article in our September issue. We apologize to Ross and to our readers for any confusion this may have caused.



Honey harvested for each year *of the study in number of supers across the four treatments. Red lines represent the control, orange lines represent quick strips, light blue lines represent treatment free with requeening and dark blue lines represent the treatment-free group without requeening. All error bars represent one standard error.*

Table 1 Colony Survival

Group	May 2016	October 2016	April 2017	October 2017	April 2018	October 2018	April 2019
Control (C)	15	14	6	5	0	--	--
Quick Strip (QS)	15	14	14	7	7	6	1
Treatment-Free (TF)	15	10	9	8	8	7	1
Treatment-Free w/Queen (TFQ)	15	15	7	6	4	4	2

Fall Honey Recipe –

Shana **Archibald**

Pumpkin Honey Dump Cake
(in the crockpot)
Spice Cake Mix (15.25 oz)
1 Box Instant Vanilla Pudding (3.4oz)
1 Can of Pumpkin (15oz)
1 ½ Cups of Milk
1 ½ Stick of Butter (melted
1 Tbsp honey

Line your slow cooker with parchment paper or liner. If you want to save yourself a clean up.

Dump the dry cake mix evenly along the bottom of your lined slow cooker. Now . . . I didn't have a spice cake mix. So, I made my own. I used yellow cake mix, 1/2 a tsp of cinnamon, nutmeg, cloves and 1/4 tsp of ginger. Then mixed it into the dry cake mix & wa la! Couldn't tell the difference.

Dump the vanilla pudding mix and then the canned pumpkin.

Pour melted butter evenly over the top of the dry ingredients.

Pour the milk evenly over the dry ingredients, and add the honey.

Take a spoon and gently mix until dry ingredients until slightly moistened.

Cook on low for three or four hours. Cooking time will vary depending on the size of your slow cooker. The larger it is, the less cook time will be needed. The cake will be slightly "wet" in the center. Kind of like a cake-ish pudding. This is a good thing, you don't want to overcook it. There are no eggs in this recipe, so wet is good. It's best when the center is cooked just slightly beyond it's original liquid state and the sides are starting to firm up. I added Carmel drizzle and cool whip, as toppings. But you can easily add some vanilla ice cream or more honey. BC

September Bear

Ron **Miksha**

Our part of the world (Calgary, Alberta, Canada) has been home to black bears and grizzlies for about ten-thousand years. In recent days, they've mostly resided in the zoo and probably as household pets in a few basements – though I hope not. When bears wander into town from the Rocky Mountain foothills, they are quickly trapped and moved away. Rather than joining Timmy's dog on a canine retirement farm in upstate New York, they tend to find themselves released somewhere along the eastern slopes.

People who live in our nearby foothills, or higher up along the slopes, are in bear country. Bears might wander into a beeyard anytime from perhaps March to November, depending in the weather. One July, we had a grizzly dig under a fence at one of our higher-elevation yards, while another year, a gigantic early-August black bear was chased out of one of our locations by my brother, who yelled and chased the bear. My brother said that he made a big mistake. Don was armed with only a hive tool and ended up quite a distance from the truck when the bear stopped, turned towards him, and rose up on its back legs, over a head taller than my six-foot-tall brother. As Don tells it, the bear looked at him from just a dozen metres away, then slowly dropped back onto all fours and ambled away – without eating my brother. Lucky Don.

I just received some notes and images from a beekeeper who lives half an hour west of Calgary. Charlotte Funke has a tidy bit of land with Bed and Breakfast lodgings in Bragg Creek, Alberta. She keeps several beehives near her house. All the pictures on this web page are from her and her security cameras. One young black bear did all the damage you see here, all in one night. Although there is a well-constructed fence, she tells me that the gate to the fence was misaligned when it was latched this weekend. The hot line was grounded, and the bear entered the beeyard. You can see, in the picture, that the fence, if properly-powered, should withstand most bear visits. (The arrow shows how the gate wasn't hooked up correctly. It was accidentally hooked to the ground wire because the cotter pin on the last live wire had fallen off.)

It's shocking how quickly a single bear can destroy an apiary. (A married couple is twice as bad.) I've seen big bears lift and carry away a hive, dropping it several metres away, probably thinking it had to take its food to the dining area. The bear featured on this page sat in place, eating. This awakened the human family whose approach scared the bear into a tree. It stayed there

Some of the damage was already repaired when this picture was taken.
Charlotte Funke photo

for an hour while they cleaned up the mess. You can see some of the damaged equipment. Bears eat wood, wax, and wires to get at the brood.

Finally, a video taken by security cameras. It was dark, the bear was at a distance, but you can see the bear, 'hiding' behind the tree before climbing up the first night, when the damage was done. The bear came back the following night, but by then the fence had been fixed and kept the bear out. A large, hungry bear might still bust through an electrified fence, anxious to fill its belly and add body fat, as bears must do in the autumn. Hopefully, this young one has had enough trouble and will look for easier pickings elsewhere.

You can see a video of the bear's visits at **https://badbeekeepingblog.com/2021/09/08/september-bears/** Sound up. I was whispering in this voice-over . . . BC

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CALENDAR

♦INTERNATIONAL♦

Alberta Beekeepers Commission Conference and Trade Show will be held November 25-26 at Fantasyland Hotel, Edmonton.

For information please visit **www.albertabeekeepers.ca/about/2021-agm-conference-trade-show**.

♦ILLINOIS♦

IL State Beekeepers Association will hold its annual meeting November 13 at the Northfield Inn, Suites & Conference Center in Springfield in celebration of their 130th year.

Registration is $20/members and $30/non-members. Pre-registration will include lunch. Speakers include Jim Tew and Adam Dolezal.

For information please visit **ww.ilsba.com**.

♦INDIANA♦

Beekeepers of IN Fall Conference will be held October 29-30 at Blue Gate Inn/PAC in Shipshewana.

Speakers include Ana Heck and Selina Bruckner. Cost is $40/members and $50/non-members. Children 15 and under/$25.

For information visit h**ttps://indianabeekeeper.com/events/fall_conference**.

♦IOWA♦

IA Honey Producers Association Annual Meeting will be held November 13 at West Des Moines Marriott Hotel, West Des Moines.

Speakers include Bob Binnie and Kamon Reynolds.

For information please contact **IHPAtreasurer@gmail.com**.

♦LOUISIANA♦

The LA State Beekeepers Association and the USDA Honey Bee Breeding, Genetics and Physiology Lab will hold the 25th Annual Field Day **November 6 (PLEASE NOTE CHANGE OF DATE)**. It will be held at the lab, 1157 Ben Hur Road, Baton Rouge.

Pre-registration is $35 for 12 and above. Children 11 and under must stay with their parents. Walk-in registration is $40.

For additional information please visit **www.labeekeepers.org** or contact Frank Rinkevich, **frank.rinkevich@usda.gov**.

♦MISSOURI♦

Missouri State Beekeepers Fall Conference will be held October 8-9 at the University of Central Missouri in Warrensburg.

Speakers include Bob Binnie and Cameron Jack as keynote speakers.

For pre-registeration, hotel accommodations, and information visit **Mostatebeekeepers.org**.

♦TENNESSEE♦

Tennessee Beekeepers Association Fall Conference will be held October 8-9 at MTSU in Murfreesboro. Early registration is $40/members and $60/non-members.

There are 35+ speakers including Chris Werner, Gary Reuter, Kamon Reynolds, Randy McCaffrey, Jay Williams, David Glover, Jennifer Tsuruda and Kent Williams.

For information see **https://tnbeekeepers.org/tba-2021-conference/**.

♦WISCONSIN♦

WI Honey Producers Fall Convention will be held November 4-6. at Hotel Mead Wisconsin Rapids.

Sue Cobey is the keynote speaker.

For information contact **Liz9120@hotmail.com**.

♦VIRTUAL♦

Honey Bee Veterinary Consoritum will be viewable On-Demand September 18 - December 31, 2021..

Online registration coming soon.

For more information see **www.HBVC.org**.

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I thought I'd been bee-stung about everywhere a man can get stung. Then one sweltering day this Summer I took off my shirt to dip it in a bucket of water. Suddenly I dropped me to my knees and howled. The tip of your nose is the worst, but that nipple sting came close.

I deeply offended a friend with a story I included in my recently published anthology of adventures and misadventures – *A Beekeeper's Life – Tales from the Bottom Board.* I know I can be a bull in a china shop, but I try to call it like I see it. Not everyone appreciates such candor, however. Unlike me, some folks are private by nature and eschew the bright lights. When I dropped off a copy of the book at my friend's house, I told him I regretted that I hadn't consulted with him first, but that the cow was out of the barn. I said I hoped he liked the story nonetheless. I thought he might. But when he called a couple of days later, he wasn't pleased. I told him I'd do what I could. He's a friend!

This poor epistle is not yet on the New York Times bestseller list. It's published on demand, mainly from Amazon sales, so there's no warehouse full of printed copies. I contacted my publisher in England, who said it would be easy to substitute another story.

At my age, you'd think I'd have learned all that a life chockfull of mistakes can teach. But no. I keep putting my hand on life's hot stove. Words can cut like a razor. I knew that before. Now I really know it.

It's mid-August as I write, and it's been a decent honey year in west-central Colorado, so far. Around here, it's generally all wrapped up by Labor Day. I regularly monitor *Varroa* mite numbers in my colonies, but that's a challenge when I have to take off honey supers to get to the brood nest to run a mite test. I try to test at least four hives every time I visit one of my yards. With a few notable exceptions, mite numbers have been reasonable, as in five or fewer mites in a 300-bee sugar shake sample. When I see more than two or three mites in a sample, I treat the hive with either Formic Pro (formic acid) or Hopguard (hops treatment). My mite numbers are generally down when I re-test three or four weeks later. Not zero mites, but hey, I'll settle for progress, not perfection. Keep in mind that these are colonies that had relatively low mite infestations in the first place.

Mite infestations spike in the Fall, as bee populations dwindle, while mites continue to breed. I try to keep the infestation level at 10 or fewer mites per sample prior to the first of December. By then my queens have generally stopped laying, and the brood is largely hatched out, leaving the mites exposed. Now I can reduce my mite load to virtually nil by dribbling oxalic acid. I like to do this on a warm day, but in a pinch, I'll quick-dribble any day the temperature is above freezing. Since I started doing this early winter treatment, my bees have overwintered exceptionally well.

Prior to that late November or early December treatment, my strategy for 70 colonies is to treat only the colonies that really need it. That means a lot of mite sampling! This gets easier once I get the honey off, and no honey supers gives me more treatment options.

My gal Marilyn likes to barter. She just paid a medical bill with honey. It was the doc's idea. She needed a doctor. He wanted honey. She traded goods for services.

Marilyn sells at three farmers' markets a week and swaps honey for vegetables, succulent Palisade peaches, and the locally roasted coffee we drink too much of. The little darling always surprises me with something.

I was going to buy some honey from Paul. He had some knapweed honey in the tank that he didn't particularly recommend, but I said I'd taste it. I missed Derrick's 7 a.m. call that the boys were about to drain the tank into barrels, but when I got to the honey house at 7:30, there was a dab of knapweed left in the tank. I kind of liked it! When I brought a little bit home for Marilyn to try, her eyes lit up. "Now that's some honey I could sell!" she exclaimed.

There's no accounting for taste. Marilyn likes to have two honey varieties for customers to sample. That way, they get all wrapped up in deciding which honey they prefer. Their decision isn't whether to buy, but rather which variety. Two honey choices are better than three, because indecisive tasters can hold up a line of customers with cash in hand.

Jet-black honeydew honey comes not from nectar, but from the sweet secretions of aphids. I harvest honeydew honey occasionally, when aphids invade the oak brush. Honeydew honey is looked down upon by some and sometimes wholesaled at a discount as "baker's honey." Europeans call it "forest honey" and will pay extra for it. So will a lot of my customers. They ask for "the Aphid Spit" by name and look crestfallen when I tell them I don't have any.

Marty works for Paul but has bees of his own, too. A few years back I bought some honey from Marty. Somebody on Paul's crew told me it tasted lousy, but when I sampled it, I found it exceptional. It was a big hit at the farmers' market, so Marilyn raised the price and sold out.

There's just no accounting for taste.

Ed **Colby**

No Accounting For Taste

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