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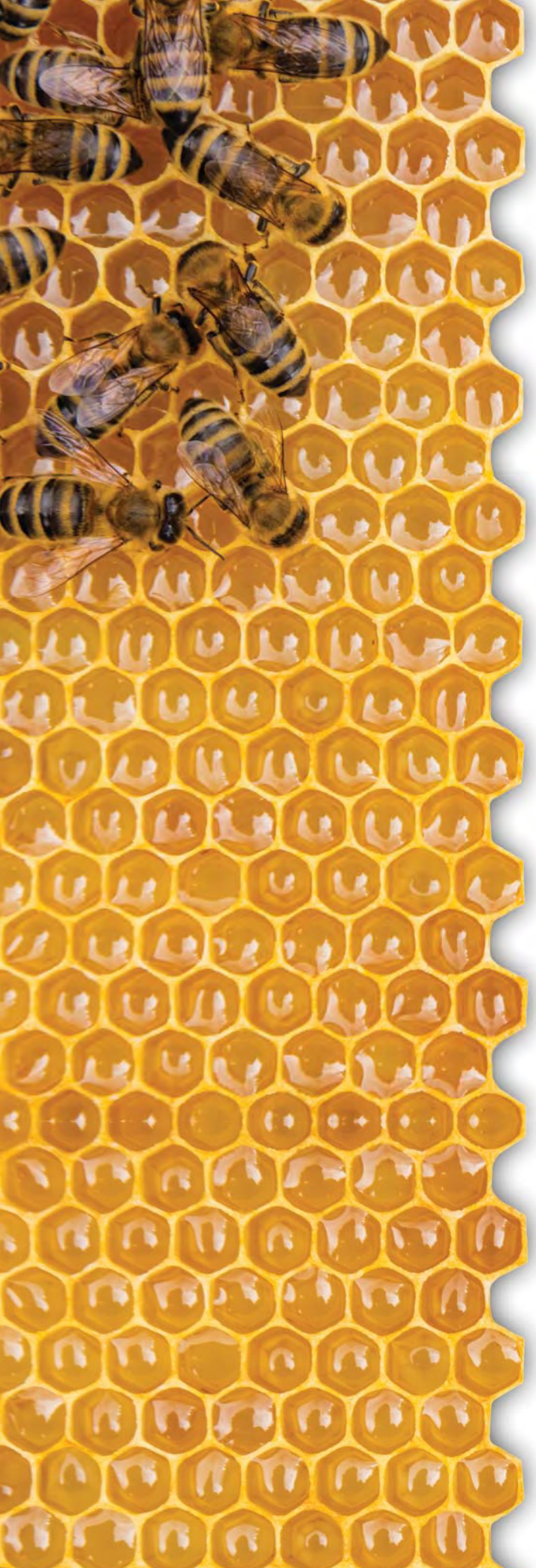

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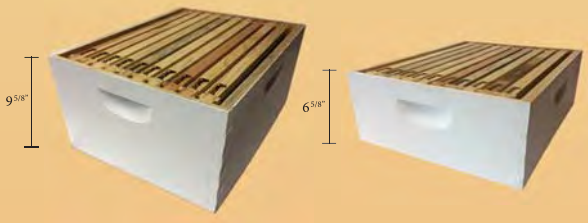

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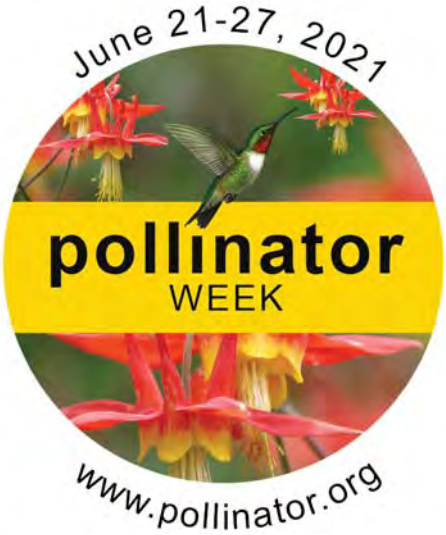

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HONEYCOMB HANNAH

By John Martin

New For The Beekeeper –

The first oxalic acid evaporator with Li-Ion technology

Varrox Eddy is the first oxalic acid evaporator with included battery. No more towing of power generators or heavy car batteries. Varrox Eddy is lightweight, handy and weighs less than 1.3 lbs including the battery. A single key press on the device is enough to start the treatment. With a fully charged battery, you can treat up to 15 hives! The full battery charging time is a maximum of four hours. The Eddy requires an opening of at least .6 of an inch high and 3.54 inches wide. Well within most hive openings.

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An oxalic acid dihydrate treatment with the evaporator Varrox Eddy is not only gentle for the bees, but also safe for the user. Place the device under the beehive and start the treatment with a single push of a button. The user can walk away from the beehive until the end of the treatment. Thanks to the LED lights, it is possible to monitor the progress of the treatment from a distance. The device signals with extra bright and colored LED lights what to do next.

Application

Treatments with oxalic acid dihydrate are best in a brood-free state. Vaporization is great to use after catching a swarm as there is no brood and you start with a mite free hive!

Simply load the proper amount of OA into the cup of the Varrox Eddy and slide it into the entrance. Seal the open parts of the entrance with a damp cloth or foam strip and start the device at the touch of a button. The treatment time and temperature are electronically controlled by the device and stopped as soon as the filled amount has vaporized.

To speed up the treatment, when the light flashes white, remove the Eddy, turn the Eddy upside down to release the used pan and replace it with an OA filled one. This helps dissipate the heat and readies the Eddy for insertion into the next hive. Seal the hive and as soon as the lights are green, start the next treatment.

Just follow the lights and push buttons! It does not get any simpler.

Want to learn more? Go to **OxaVap.com**!

NOD Apiary Products Ltd. is proud to announce the addition of Dr. Heather Broccard-Bell to the NOD team as Honey Bee Health Researcher, effective immediately. As head of research activities, Dr. Broccard-Bell will contribute to NOD Apiary Products' commitment to innovation, quality and education for the betterment of the global beekeeping community.

Dr. Broccard-Bell joins the NOD team with an impressive education (B.A. in Psychology, M.Sc. in Neuroscience and Ph.D. in Behaviour and Evolution), as well as research experience specific to beekeeping, honey bees and animal health.

She has spent over 15 years designing and conducting studies on animal health, and the past seven years focusing on honey bee health, disease prevention and understanding how bees communicate. Dr. Broccard-Bell has also devoted many years to teaching biology, psychology, and neuroscience university courses, making her a perfect fit to lead NOD's research and education programs.

"We are beyond excited to welcome Dr. Broccard-Bell to the NOD team. We have always put a strong focus on innovation and education here at NOD, and to have Heather leading our upcoming Honey bee Health Education Centre is a very inspiring time for us," said Kathleen Ireland, Director of Sales and Marketing of NOD Apiary Products Ltd.

NOD's future Honey bee Health Education Centre, which will aim to provide hands on beekeeping courses through mentorship, aligns with Dr. Heather Broccard-Bell's new role and her passion for delivering interactive educational lectures on honey bees.

Dr. Broccard-Bell shares, "It's a common perception that successful agricultural practices must be opposed to environmental concerns. However, NOD's products and focus on education make it abundantly clear that there are ways in which agricultural practices can minimize impacts on native ecosystems and human health, while supporting productive and profitable businesses. I am absolutely delighted to join NOD in their efforts to further realize this goal!"

About NOD Apiary Products

NOD Apiary Products Ltd. is a Canadian company formed in 1997 by beekeepers in Canada. Honeybee and animal health is our focus. The founders at NOD developed a practical, sustainable miticide for the beekeeping industry that uses formic acid as the active ingredient to control varroa, tracheal and tropilaelaps mites. When properly formulated, this organic miticide eliminates the risk of residues in the hive and can be used safely during the honey flow. Formic Pro® and Mite Away Quick Strips®

(MAQS Beehive Strips) are registered in several countries across Europe, and in Canada, The United States, and New Zealand.

NOD Apiary Products Ltd. continues to aid the developing apiculture industry by producing organic and sustainable Honey bee health products. NOD Apiary Products was awarded the Ontario Premier!s Award for Agri-Food Innovation Excellence, 2006, Innovation Project of the Year, 2008 and Agri Business of the Year, 2011. Our passion is Honey bee health and young livestock wellness, and as such, we are dedicated to environmental stewardship. To find out more about NOD Apiary Products Ltd., please visit **www.nodglobal.com**.

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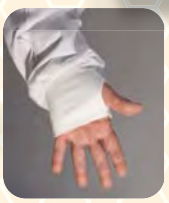

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A little History.

As an official knowledgeable, experienced, wise beekeeper (Old) here is what I was swept along in. *Varroa* mites were first ID'd in the U.S. in 1987. This started the slippery slope that many of you have absorbed as 'normal' honey bee colony health and management issues. For me as a beekeeper this was transformative. Before this the only thing beekeepers generally had to think about was AFB and EFB. Several years later we had this thing that we named Colony Collapse Disorder or CCD. We called it Colony Collapse Disorder in 2006 because we didn't know what it was at the time so it was a 'Disorder'. Now we know it is a multi-factorial chronic issue that is primarily the impact of *Varroa*/*Varroa* Virus Legacy. But, these and other additional pest, predators and diseases, such as SHB, and viruses like DWV that caused a rise in honey bee colony deaths from an average of approximately 10% to 30%-40%-50% and more brought reality to the rest of our world about the health of honey bees. Honey Bees were considered the 'Canary in the Coal Mine' because they interact with our environment in many ways and what was this dramatic change in honey bee health? What did it mean for us? What did it mean for pollinator dependent food production? What did it mean for the environment that also depended on pollination for plants to reproduce and the seeds, nuts, berries that feed wildlife? The media grabbed ahold of this apocalyptic scenario. And most everyone who is not a beekeeper knows of our struggles. Then add in the 4,000 or so other 'bee' species in the U.S., along with some butterflies, moths, beetles and birds that add value as well and the general public now was informed and was concerned because it was real to them. In 2006 the United States Senate created National Pollinator Week to recognize the tremendous value of managed honey bees and other pollinators. It was first celebrated in 2007. Now there are hundreds of Federal, State, and Local agencies, conservation organizations, environmental groups and of course the Honey Bee Industry who have broad and specific activities to encouraged all of us to do during this week in 2021 of June 21 thru 27th.

Any recognition of the importance of managed Honey Bees and other pollinators is valuable. Why? I am going to guess that none of us are totally self-sufficient in food production. When you walk into your favorite Big Box or little box grocery you don't walk into the paper towel or toilet paper aisle. No, you walk into the Produce Section. This is where color, smell, taste and nutritional value reside. And these fruits, nuts, veg, greens are there predominately because a managed honey bee helped that plant have 'sex' and move pollen from one flower part to another. Plants can't pull themselves up by the roots and walk over and fertilize a seed embryo. They have come up with this amazing collaboration with an insect. Two different species cooperating. They somehow agreed that if you will take my pollen over there to that other flower I'll share some sweet nectar with you and you can keep some of the pollen too. Wind pollination is very inefficient and resource dependent. These two totally different species, a plant and an insect, decided to cooperate. We humans are the same species and we can't even cooperate.

A few years ago Whole Foods focused on the importance of pollinators. Here is a before and after picture of what their produce section would look like without Honey Bees.

Then think about you and your neighbors backyard vegetable and flower gardens. Let's say for easy math reasons that Honey Bees can forage efficiently in about a two mile radius of their colony. That is approx. 8000 acres. Think about what is growing in 8000 acres around your home and/or home apiary or outyard. How many flowering plants are there over a years time? How many of those are producing food for the grower to eat or sell? How many are producing food for deer, turkeys, birds of all sorts, raccoons and who knows what else? How many seeds go uneaten that germinate and allow the plant or tree to extend its genetic survival?

The impact of what you do as a hobby beekeeper with two colonies in your backyard, a sideline beekeeper with a 150 colonies or a commercial beekeeper with 5000 is unbelievably tremendous. That is why National Pollinator Week is for you to highlight with your friends, neighbors and community in a variety of different ways how vitally important honey bees and other pollinators are. The place to go to get some ideas is; **https://www.pollinator.org/pollinator-week**

Do it:)

From The Editor –

It's Summers Time –

Bees, Plants and Maybe Summer?

The first weekend in May we drove to Wooster, about 45 minutes from us, to pick up some package bees. It was a nice drive and we caught up with several familiar faces. Jim Tew and his long time friend Bob were there. Jim Thompson, who used to work with us here at the Root Company and our editor Jerry. It was good to see these guys, but the reality is we were all there because we all had Winter losses. But we diligently try again and this year we promise ourselves that we'll do better – we'll try new and different things. So good luck to all of us who lost bees.

We picked the bees up on Sunday and went right home to install them because the forecast was rain for the next two or three days – and it did. And it's been mostly cold and rainy since we got them in. Not a great way to start.

Most of you might not know this about Kim and I but we have an addiction – to plants. We seem to not be able to drive or walk past any kind of plant sale without stopping and about every time buying something.

There is an abundance of nurseries in our area within a half hour drive at the most. Several are family owned businesses that have been in NE Ohio for a long time. So in addition, to our love of plants – any kind of plant – we get a lot of pleasure in supporting local businesses. This past weekend in the cold and the rain our local Herb Society had a plant sale and you know we went home with a several new plants to add to the ones we already need to get potted or in the ground.

Our Medina Farmer's Market opened two weeks ago and we also visited them in the cold and the rain. I hope you all have access to good local food, plants, crafts, whatever it may be. I encourage you to support your neighbors. They work hard and of course, this past year has been particularly hard on them.

Speaking of the weather – as I write this yesterday was Mother's Day. It rained – ALL DAY! Except for the time that it was snowing. Yes, snow on Mother's Day. Not a lot, but enough to remind us of what a strange weather year this has been already. Can't wait to see what Summer brings.

Don't forget about our October event. Check out the information on page 48 and watch our web page for registration. That will be June 1.

We wish you all a warm, sunny Summer and hope to see you somewhere along the way.

Happy Summers

Kim with plants from the herb sale.

Jim Thompson and Jim Tew taking a minute to catch up.

Bee Culture's own Jerry Hayes heading home with his packages.

Our backyard and deck on April 21. We are ever hopeful that we're done with snow until October. Keep a good thought.

NEXT MONTH

Region 1
- Add Supers
- Alcohol Mite Wash Sample
- Monitor for Swarm Control
- Feed Splits and Nucs
- Be sure colony has room to expand
- Consider Rearing Queens
- Put Comb Honey frames in.

Region 2
- Monitor Colony Strength
- Add Supers if needed
- Sample for Mites/Alcohol Wash
- Swarm Control
- Hope Flow Starts and stays Thru June
- Check Queen Laying Pattern
- Be sure Splits and Nucs are Queenright
- Check for SHB
- Replace Queens

Region 3
- Continue to Monitor Space/Add Supers
- Extract Honey
- Alcohol Wash for mites
- Check SHB Traps
- Split Hives/Make Nucs
- You should have already done everything.

Region 4
- Alcohol Wash for Mites Survey
- Add Supers
- Make Summer Splits
- Check Mite Sticky Boards
- Manage Swarming
- Re-Queen where needed
- Keep entrances clear of tall weeds
- Make Comb Honey
- Extract Late Spring Honey

Region 5
- Feed
- Sample with Alcohol Wash for Mites/ Treat if needed
- Check Queen for Pattern and area laid
- Super for early Spring Flow
- Supplemental Feeding if needed
- Consider Early Splits
- Inspect colonies for disease

Region 6
- Monitor Swarming
- Early Spring supers if anticipated
- Check colony for space to expand
- Alcohol Wash for Mite check
- Make early splits
- Feed if required
- Check for Disease Control needs
- Re-Queen aggressive colonies in SW

Region 7
- Alcohol Sample and treat for *Varroa* as needed
- Add supers
- Inspect colonies for overall hive health
- Anticipate early spring flow
- Re-Queen where needed
- Make splits
- Leave them alone if you have done your job

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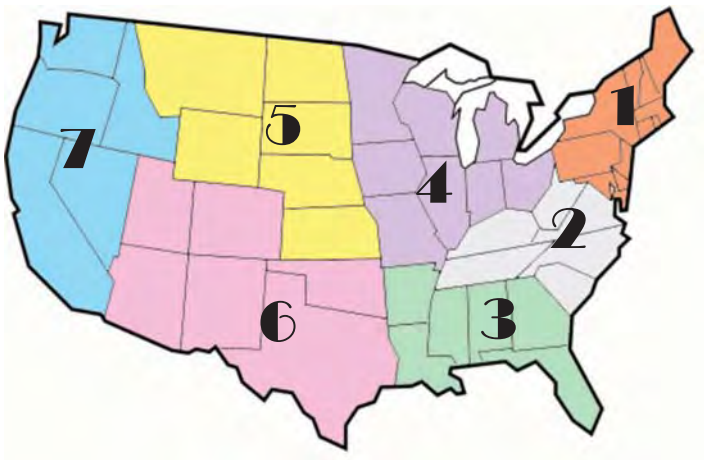
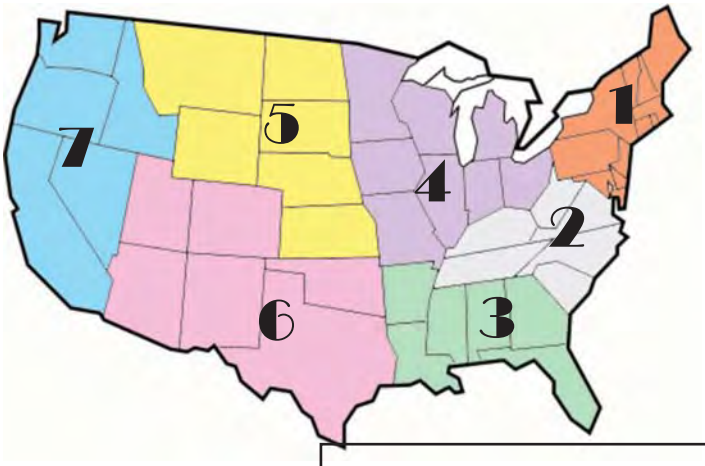


JUNE – REGIONAL HONEY PRICE REPORT



	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	2.06	2.18	2.42	2.20	2.33	2.03	2.50	1.70-3.00	2.23	2.23	2.23	-
55 Gal. Drum, Ambr	2.08	2.15	1.91	2.24	2.35	1.88	2.93	1.10-4.00	2.14	2.14	2.19	-
60# Light (retail)	212.22	186.50	187.50	202.00	186.67	170.13	218.33	120.00-300.00	198.70	3.31	204.26	-
60# Amber (retail)	207.00	185.00	187.50	179.50	220.00	164.18	198.70	120.00-285.00	193.46	3.22	198.17	-
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	104.48	74.20	113.58	81.65	126.60	113.58	113.58	61.20-194.40	99.36	8.28	89.16	-
1# 24/case	160.89	128.73	121.60	117.45	197.67	82.38	156.00	45.00-300.00	142.91	5.95	134.01	-
2# 12/case	138.53	101.20	100.00	105.84	76.26	131.07	132.00	40.68-246.00	118.81	4.95	124.11	-
12.oz. Plas. 24/cs	105.33	149.98	100.00	94.42	94.72	107.76	108.00	66.00-288.00	106.96	5.94	107.81	-
5# 6/case	149.45	114.13	144.59	113.90	113.16	144.59	144.59	71.50-240.00	133.44	4.45	139.22	-
Quarts 12/case	179.69	171.06	137.20	151.92	149.37	155.44	183.00	69.54-300.00	160.11	4.45	163.53	-
Pints 12/case	88.98	98.19	80.33	95.46	106.03	109.00	96.00	60.00-144.00	96.21	5.35	95.03	-
RETAIL SHELF PRICES												
1/2#	5.77	5.11	4.25	5.44	5.90	2.48	5.59	2.48-9.00	5.44	10.88	5.25	-
12 oz. Plastic	7.32	7.17	4.95	5.85	5.13	4.88	5.40	3.79-12.00	6.29	8.39	6.11	-
1# Glass/Plastic	9.24	8.22	7.32	7.35	9.01	6.10	8.13	4.79-17.00	8.30	8.30	8.68	-
2# Glass/Plastic	14.66	14.83	11.27	12.71	13.90	6.49	13.00	6.49-25.00	13.54	6.77	14.06	-
Pint	11.73	11.29	9.99	12.89	9.42	11.18	9.80	4.00-26.25	11.08	7.39	10.90	-
Quart	22.87	18.30	15.12	17.18	16.46	24.33	18.05	7.99-42.00	18.80	6.27	18.31	-
5# Glass/Plastic	32.34	27.50	16.00	26.50	27.09	17.89	30.88	15.00-50.00	29.27	5.85	30.76	-
1# Cream	9.87	8.16	8.00	8.97	7.00	10.53	13.00	5.36-18.00	9.38	9.38	13.02	-
1# Cut Comb	13.37	12.45	10.24	12.61	12.67	13.56	13.00	7.00-22.00	12.63	12.63	13.02	-
Ross Round	11.16	7.10	11.31	12.50	11.31	12.00	13.75	7.00-16.80	10.71	14.29	11.02	-
Wholesale Wax (Lt)	7.79	8.95	5.58	6.11	5.06	4.17	8.25	2.00-16.00	6.75	-	7.20	-
Wholesale Wax (Dk)	6.86	5.00	4.53	4.58	7.33	3.00	15.00	2.00-15.00	6.16	-	6.90	-
Pollination Fee/Col.	91.27	68.33	70.00	97.50	140.00	106.65	50.00	50.00-200.00	88.29	-	92.11	-

What a difference a year makes. Last year because of COVID we did not have a May Honey Report. Happily we are all back in place here at Bee Culture and hopeful for the future.

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Technology Tips For Beekeepers

Malcolm T. Sanford

DIAGNOSIS AND MAPPING OF EMERGENT HONEY BEE HEALTH ISSUES VIA AN AI-POWERED SMARTPHONE APP

Jerry Bromenshenk, Robert Seccomb, Colin Henderson, David Firth, Geoffrey Pepos;Bee Alert Technology, Inc.; USA; beehealthguru@gmail.com

The Bee Health Guru app provides a way to improve honey bee colony health by letting bees communicate their health status to their keeper. The bees become the guru, indicating colony health via their sounds. Our app: (1) Allows beekeepers to record colonies with a smartphone; and (2) Uses Artificial intelligence (AI) algorithms to diagnose each colony's health. These algorithms are not static but can learn based on new training data. Currently, we are tuning the app for accuracy. Our first step consisted of years of audio recordings from research projects. These provided the proof-of-concept, demonstrating accuracies ranging from 86-98% for eight critical colony health variables. Starting in August 2019, our second step recruited beekeepers worldwide to download the application, inspect colonies, and upload the app's diagnoses along with their recordings. Within two weeks of the app's release, we had 653 participants and 400 data uploads, which yielded geo-referenced data maps. These maps showed locations reporting healthy colonies and those reporting colonies with pest or disease problems. Our smartphone application automatically creates a copy of all recordings, beekeeper observations and combines them into a comprehensive, transformative AI colony health diagnosis system featuring real-time monitoring and mapping. All electronic records are stored in a secure, cloud-based destination with safeguards to protect data privacy, confidentiality, and security. We recently added a report-back to the beekeeper feature based on user feedback, automated the mapping, and began producing training videos to use the app effectively. 13 minutes: https://tinyurl.com/jpm995wy

TOOLS FOR TRANSFORMING DATA INTO KNOWLEDGE

Jerry Bromenshenk; Bee Alert Technology, Inc.; Andrew Dudley; Golden Software; USA; beeresearch@aol.com and andrew@goldensoftware.com

Regardless of the size of a beekeeping operation, there are times when it is useful to visualize spatial data. Suppose that I have two hives in my backyard; I suddenly discover an infestation of mites, and I would like to reference regional or national maps of varroa outbreaks? If I had 10,000 colonies across multiple states, I might ask whether there are tools to chart where my hives are at, how they are doing, and where, if any, are there problem spots. Also, I might want to overlay my apiary locations over vegetation and habitat maps, or maybe pollen maps. Routinely used in industry, business, university settings, geo-spatial analytic tools are available to anyone to run on home computers. The best programs are intuitive to use and powerful.

In this video presentation, I interview Andrew Dudley, Product Manager, and Training Lead for Golden Software. I have been using their 2-D and 3-D modeling and visualization software for nearly 40 years ago. One of the founder partners has ties to the University of Montana. Think of them as a geo-spatial counterpart to the MS Office Suite of Programs, such as MS Word, Excel, Powerpoint, One Note, Outlook, Teams, and OneDrive, where Golden has Surfer, Grapher, Strater, Voxler, MapViewer, and Didger. They offer powerful analytic tools and publication-quality, high-resolution plots. They are not the only company offering visualization tools, but their pricing is comparable to others' annual costs and I have always found their technical support to be readily available and helpful. 13 minutes https://tinyurl.com/jwhbh4uu

BEEXML: STANDARDIZING THE WORLD'S BEE DATA

Joseph Cazier; Appalachian State University; Dick Rogers; Bayer Crop Science; Ed Hassler; Appalachian State University; Agnes Gambill; Appalachian State University; USA; cazierja@appstate.edu

https://beekeep.info/vita_details

This presentation explores the role that data science and machine learning can play in helping bees and illustrates the need for data sharing. We then summarize efforts by Apimondia Working Group #15 to enable data sharing through data standardization, data policy recommendations, and data harmonization efforts. A new journal, BeeXML: Journal for Bee Data Standardization, is introduced as a vehicle for data standardization. We conclude with ways you can help these efforts. 13 minutes: https://tinyurl.com/dm3dwcuj

STUDY HALL

Q – *I'm no scientist, but I think the biggest problem with glyphosate is that it enables farmers to be very effective and efficient at killing weeds. Result: no fodder for the bees.*

I agree that surfactants could be lethal to insects. But if it isn't applied while pollinators are present (ie no flowers present), I don't see how it could be a significant threat to the honey bee or to native insects.

Blaine Nay

A – You are correct on both counts Blaine.

But, in this imperfect world more weeds mean less production and less value for a farmer. And who pays ultimately for short supply? We the consumer wind up paying more for less supply.

And, yes spray before plants bloom. FOLLOW LABEL DIRECTIONS which most suburban homeowners fail to do to keep their lawn looking like the 18th Hole at Augusta.

Q – *Hi Jerry,*

Just downloaded the April issue and on page 20 came across yours and Tom Seeleys answer about bees and snow.

Your answer was: I don't know all about honey bees and Tom Seeley writes:

"I think this is a good example of how the housing arrangements that we beekeepers provide for the bees can make life harder for them."

Certainly both answers have some truth in it. However, there might be a scientific explanation to this observation. In the literature one discovers sometimes an answer to odd questions like this one. Enclosed you will find such an alternative interpretation why such crashes can happen, published in a book by Eva Crane (chapter 6.54, copy enclosed).

In Winter if the sun shines on a hive the rising temperature at the the hive entrance will lure bees outside and they even start flying, even though the air temperature is way below optimal. As explained in the book, bees can get confused in this situation with their up/down orientation and will crash on the snow and die of cold.

In an old Swiss beekeeping manual (1985) it is recommended to scatter ash on the snow or cover it with a dark blanket. This will get grounded bees a foothold and will melt the snow faster. Helpful idea but worth the extra work? I haven't applied this trick myself since the observed losses are minimal/negligible.

The fact that bees can get confused with the up/down orientation is in my opinion remarkable and interesting. As delineated in the book it can also happen on a white sand beach. This time without any grave consequences to the bee, dusting off the wings is all that is necessary!

Hope this is helpful?

Best regards from Corona-lock-down-stricken Zurich (Switzerland) – Hans

A – As I have thought about this, generally do you think it is sunlight/UV reflecting off the snow and causing what you and I may have experienced going from a dark room to sunshine in our eyes. For those in snow areas sometimes it is called snow blindness. Or you are asleep in your bed and somebody comes in and turns the light on and you can't see for bit.

Q – *I have a burning question about* Varroa *mites. On the one hand I constantly read test, test, test and treat, treat, treat. On the other hand there are those who neither test nor treat – like Kirk Webster, who is the only person I've ever purchased bees from – but my most recent purchase was 15 years ago. I replace losses from splits and swarms so have not brought any outside bees into my apiary, aside from the occasional "abandoned" hive that desperate homeowners have begged me to take when their beekeeper disappeared. I've used oxalic acid – two treatments during a broodless period- exclusively, for the 17½ years I've been keeping bees, with great success for the first 13 years or so, with losses averaging 6% for 11/13 years, eight of those with 100 hives. I thought that was a compromise between treating and not treating. Since my queens are open mated and I can't control who they hook up with, I thought it unfair to go no treatment. I've had significant, for me, losses three out of the past five years. Was I just lucky (because there weren't many other beekeepers where I live) for those first 13 years? I live on the East End of Long Island, aka "The Hamptons" where in recent years bees are the new chickens, so there are suddenly a lot more bees. Now that everyone is treating so much more are bees less resistant and my bees are now crossing out with those bees?*

Thanks again for all You do to support both bees and their keepers. Sincerely, Mary Woltz

A – Not to be a pain but that is why I sometimes get so frustrated that we are still losing 30%-40%-50% of colonies every year since *Varroa* were found in Florida on Sept.25th 1987.

The best document to use is the Honey Bee Health Coalition, 'Tools for *Varroa* Management' Guide. Memorize it. **https://honeybeehealthcoalition.org/varroa/.**

Every honey bee colony has *Varroa* mites in it in the U.S. Because of isolation from other colonies some colonies can stabilize this parasitic relationship for a short time because they are not being subjected to other colonies in the vicinity that become

'*Varroa* Bombs' due to lack of beekeeper management. The *Varroa*/Virus legacy has different effects on different genetically based bees as the bees' individual immunity and the immunity of the colony influences how the significant individual Viruses impact the bees/colony.

Any beekeeper who does not sample for *Varroa* using an alcohol wash multiple times a year and then use the 'Tools . . .' Guide above to make management decisions is jeopardizing every honey bee colony in close or far proximity. This is no different than someone with a dog or a cat who does not manage for fleas and ticks. If they don't manage for fleas and ticks and the pet gets in contact with other pets at the kennel or the Park guess what happens? And they must have their house fumigated.

Sample, treat if needed (Tools Guide), Sample again to see if treatment worked.

Those who do not treat and successfully manage colonies to stay alive are few and far between.

We in the U.S. have such high losses EVERY YEAR because most hobby beekeepers don't know how to get past buying packages every spring as they blame somebody or something else for their losses.

Q – *When is the best time to spray fruit trees?*

A – Honey Bees are attracted to 'flowers' as a nectar and pollen food resource. You don't want to spray open flowers that honey bees may be on and get sprayed or have your fruit tree pesticide spray contaminate the nectar or pollen in the flower that honey bees may collect, take back to their colony and poison their sisters.

So spray when there are no blooming flowers or after flower bloom and fruit is beginning to form. Honey bees won't be there as there is no food for them in the form of pollen and nectar.

And it isn't just the fruit tree blooming. What flowering plants are growing on the ground under the fruit tree. Dandelions are typical on the orchard floor at spring fruit tree spray time. Honey bees love Dandelions because they are a rich source of pollen and high sugar content nectar.

Q – *When beekeepers apply Oxalic acid, especially the vaporizers, the label direction say to wear a respirator, goggles, gloves etc. so they are protected from the Oxalic acid. But the way I understand it certainly the acid itself is a potential burn agent, but you don't want to get it inside your body. That is because when Oxalic acid gets in contact with calcium in your body it causes Chelation. Chelation means to 'grab' or 'bind'. Oxalic grabs calcium and when it is trying to be excreted from the body sometimes it results in 'kidney stones' ie. calcium particles that hurt like the dickens as they make their way out through urine.*

Honey bee adults, larva and pupae have calcium in them. Does this happen to them with Oxalic acid too and cause additional honey bee health issues?

A – (Ans. Dr. Jay Evans) So 600 mg/kg is 120 ug/bee (if a bee weighs 200 mg).

Multiply that by 30,000 bees and the needed dose if an entire treatment were ingested by bees is 3,600,000 ug or 3600 mg or 3.6 g.

Dribbled in sugar water, oxalic is legally given at 35 g /liter or 1.75 g per 50 ml colony-dose.. so they would have to eat it all and then some and hopefully are too smart to do so.. but if it accumulates over time?? I think oxalate breaks down in days so there should not be carry-over between treatments so that is not a big worry.

So unless someone did something totally crazy like feed a colony 80 g of oxalic in a chewable shop towel (???) I think these acute effects are not likely to manifest themselves.

Q – *I just was able to get in a colony and clean off the bottom board. There were many dead bees and their heads had come off. What's up? – Arnold*

A – When bees have died, and they lay around for weeks they simply dry out. The honey bee head is only marginally connected to the thorax by a thin tube that contains the nerve cord, hemolymph 'vein' and the esophagus. When the bee is dead, and dries out, body parts get brittle and the weight of big head breaks the tube and it falls off.

Q – *I am thinking about retiring and want to expand my colonies and start a business based on beekeeping. I can't seem to find a really good example of what I should look at.*

A – List what products or services you most enjoy producing.
Investigate the market demand for those products.

Write down how many hours you are willing to work a year, and how much you want in return.

Then do the math on a spreadsheet to see how many hives it would take to realize your goals.

You may find that it just doesn't pencil out. If not, adjust, or let it go.

On the other hand, you may find yourself in a perfect position.

The goal is to have a waiting list for every product and service you produce, and keep your prices low enough to sustain that demand. Make a decent income, and plow investment back into our employees and business. But this may only work if one lives where one can produce a diversity of products (pollination services, bee and queen sales, honey and wax sales, specialty products).

There is a hard learning curve to running a bee business, and many ways that can work (compared to an infinite number of ways that don't work).

You might also want to take a look at Kim Flottum's book, *In Business With Bees.*

Propolis For COVID-19

Andresa **Aparecida Berretta**[1], Marcelo **Augusto Duarte Silveira**[2], José **Manuel Cóndor Capcha**[3], David **De Jong**[4]

Summary of evidence that propolis can help reduce the impact of COVID-19.

Propolis:

1. Has antiviral properties.
2. Can potentially block attachment of the virus to host cells.
3. Improves the immune response against infections.
4. Can reduce exaggerated immune response that damages lungs and other organs.
5. Helps reduce the symptoms of comorbidities associated with high mortality rates in COVID-19 patients.
6. Is safe and inexpensive, and widely available (without a prescription) and can easily be consumed as an extract diluted in water, as a mouth spray or in capsules.
7. Was found to be safe and efficient in the treatment of kidney disease (a common problem in hospitalized COVID-19 patients).
8. Reduced symptoms and anticipated release from medical care in hospitalized COVID-19 patients in a clinical trial.

Why consider propolis as an option for treating COVID-19?

Propolis products, especially extracts and mouth sprays, are found in every pharmacy in Brazil and are widely recognized as a health aid by the public there. The demand for these products has greatly increased because of the COVID-19 pandemic. This increase in demand for propolis has also affected propolis exports, especially to Asian countries, including China, South Korea, and Japan. South Korea made a change to the legislation involving functional foods in March 2020, to facilitate the registry of new propolis products and formulations. Currently, there are many research projects investigating possible remedies for treating COVID-19, and among the numerous alternatives, propolis and its components have appeared as a promising alternative. However, although there is considerable evidence that propolis can be a useful health aid, we need to understand how propolis could help against this new disease.

What is propolis and why does it have medicinal properties?

Plants, through a long evolutionary process, have developed bioactive substances that allow them to survive the attack of enemies, including herbivorous insects and pathogenic microorganisms. These substances can be an integral part of the plant, or they can be produced as exudates in response to the attacks of insects or pathogens. Many of the medicines that we use today were originally derived from plants and man continues to investigate plants around the world in a search for new options. The bees take advantage of these antimicrobial properties, choosing and collecting these materials from the plant species that have the most useful bioactive substances. They manipulate these resins and plant parts, adding enzymes and other substances, such as beeswax, to produce propolis. Propolis protects the colony against invaders, creating a physical barrier that is chemically active. The inner surfaces of the hive are "painted" with propolis to help maintain a healthy home for the bees. Man discovered the properties of propolis long ago, a fact that is recorded in ancient cultures, including in Egypt more than 3,000 years ago, and its use by man continues in many regions of the world.

Strategies to confront the COVID-19 pandemic – Prevention, Resistance and Tolerance

Prevention would be everything that we do to avoid being contaminated with the virus, including quarantines, social distancing, masks, cleaning, testing for infection, and contact tracing. **Prevention** measures have been the main tool used worldwide to control the COVID-19 pandemic. Unfortunately, despite drastic measures, including border controls, school and business closings, infection and mortality rates continue high. The high risk of infection and its consequences will continue until a large percentage of the population has become infected or vaccinated.

Resistance involves factors that interfere with the infection process and multiplication of the virus in host cells, including staying healthy and having a fully functional immune system. Other measures include treatments that can block infection or in some way interfere with replication of the virus after someone is infected.

Tolerance to a disease would be the ability to live with infection, with minimal disease effects and damage, eventually overcoming the disease. In the case of COVID-19, in a large proportion of people who become infected, **tolerance** has been insufficient to avoid serious damage and considerable mortality. Most interventions have involved trying to reduce the impact of the worst symptoms, with few safe treatment options available that can control the disease course.

Propolis can help with resistance and tolerance?

Propolis has many characteristics with potential to help increase **resistance** against the SARS-CoV-2 virus and **tolerance** to COVID-19 disease. However, to determine if it would be worthwhile to investigate propolis as an aid to help deal with this pandemic, we evaluated the evidence that propolis has useful properties for this endeavor.

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Propolis could increase resistance against infection with the SARS-CoV-2 virus

To invade a host cell, the SARS-CoV-2 virus attaches to a cell surface receptor for ACE2 (angiotensin-converting enzyme 2). Research done *in silico* (using computer simulations) have demonstrated that various propolis components would strongly bind to ACE2, which would interfere with the attachment of a surface spike protein of the virus to this receptor. This *in silico* evidence has been confirmed *in vitro* in the laboratory. Another protein key to allowing the virus to enter the host cell is the serine protease enzyme TMPRSS2, well studied because of its importance in various types of cancer, and which cuts the viral spike protein, allowing it to invade the host cell. Propolis also has properties that reduce the production of TMPRSS2.

Other evidence that indicates that propolis could help with resistance against the SARS-CoV-2 virus is that various propolis components have shown antiviral properties in animal models, including flu, herpes, HIV, polio, adenovirus, rotavirus, and various types of coronavirus. In the case of herpes, clinical studies in humans have shown that it effectively reduces infection.

Propolis could increase tolerance against COVID-19

Different from the flu, the common cold, and all the other viral diseases that have afflicted humanity in modern times, COVID-19 has caused high mortality rates throughout much of the world. This happens because our **tolerance** to infection by the virus is insufficient to avoid considerable damage. One of the most relevant factors is that infection with the SARS-CoV-2 virus provokes an exaggerated inflammatory process, especially affecting the lungs. This lack of **tolerance** is greater in various comorbidities associated with high mortality in COVID-19 patients. Many of the conditions considered to be of high risk in this pandemic also involve inflammatory processes, including diabetes, high blood pressure, various types of cancer, obesity, and chronic kidney disease. The elderly, besides having more problems with comorbidities, also tend to have a weakened immune system, with low overall **tolerance** to diseases.

This inflammatory process, which has overloaded intensive care units with patients, involves a "cytokine storm". Cytokines are chemicals that cells use to communicate with each other. Although they are essential for life, they can get out of control and cause damage in various disease conditions. An enzyme, a kinase named PAK1, is an important mediator of the exaggerated inflammatory process provoked by COVID-19, resulting in an overproduction of pro-inflammatory cytokines, including interleukin 6, interleukin 1 tumor necrosis factor (IL-6, IL-1 and TNF). Various studies have shown that propolis is a natural PAK1 blocker, reducing or even avoiding the overproduction of these pro-inflammatory cytokines. A recent publication investigating natural PAK1 blockers for treating COVID-19 indicated that propolis was one of the most promising options.

Bees on Baccharis dracunculifolia *(Asteraceae), known in Brazil as* ***alecrim do campo*** *or "wild rosemary" because it looks like the spice plant rosemary, though it grows wild as a bush, six to 10 feet high. This is the origin of Brazilian Green Propolis.*

Bees foraging on Baccharis dracunculifolia *to collect resins and plant parts to make propolis. This plant is mainly found in Minas Gerais state in Brazil, where almost all Brazilian Green Propolis is produced (one of 12 officially recognized types of propolis in Brazil).*

SARS-CoV-2 inhibits the host immune response during early stages of infection, facilitating viral replication. However, in advanced disease stages, this same virus can provoke an exaggerated immune response that damages the lungs and other vital organs. Different from most modern immunosuppressing medications, which have strong and specific effects, propolis has properties that can help avoid immunosuppression during initial infection and in later disease stages avoid an exaggerated inflammatory response by the host, protecting against damage that can be fatal. This type of regulatory activity is called immunomodulation.

Among the types of damage found in severe cases of COVID-19, thromboses and microthromboses can affect various body organs, especially the lungs, and can eventually result in mortality. Respiratory function can be compromised, sometimes provoking problems such as chronic tiredness even after the patient has been cured of the viral infection. Propolis has demonstrated anticoagulant properties that could protect against these effects, without the problems posed by much more powerful anticoagulant drugs, the use of which has generally been avoided for COVID-19 patients because of the risk of undesirable collateral effects. A natural remedy that has less potent activity could be useful in situations where the modern and more potent medicinal alternative would not be advisable.

What limits the use of propolis as a medicine?

One of the criticisms that limits that use of propolis as

Hive boxes spaced so that bees will build propolis strips in the gaps.

a medicine is the natural variability of this bee product. Its properties can vary according to the species of plants that produce resins and other bioactive plant materials in each region. Propolis from different countries or in different regions of a country varies according to the available plants that produce these substances. Considering only Brazil, at least 12 different types of propolis have been characterized. The most famous is Brazilian green propolis, produced by honey bees in regions where there is an abundance of the wild bushy plant that is called "field rosemary" (*Baccharis dracunculifolia*), mainly in the state of Minas Gerais. Each lot of propolis harvested from the colonies to produce extracts and other products can vary in the content of bioactive substances, such as terpenoids and flavonoids, and consequently have variable biological properties. Though almost all types of propolis have relevant medicinal effects, the lack of uniformity in the product has inhibited its acceptance and widespread use, especially in the USA and Europe.

It is unlikely that a company would make the necessary investment to register a natural product as a medicine because there is no guarantee of exclusiveness of sales to recover the investment. An example of this situation is Brazilian green propolis, which is highly valued in other countries for various uses, including for treating cancer. Companies in Asia have identified the most active components against cancer in Brazilian green propolis, synthesizing and registering patents for these substances. Nevertheless, the mixture of the various components of propolis, without separating them, has various important effects, frequently involving synergisms, which can be more useful for combatting the multiple noxious effects caused by disease organisms.

Standardized Propolis

Given the great variability found in propolis, a standardized propolis extract, denominated EPP-AF@ was developed. It is standardized in terms of phenolic compounds and flavonoid content and has a characteristic and reproducible (lot to lot) "fingerprint", which includes the components caffeic, p-coumaric, and cinnamic acids, aromadendrene, isosakuranetin and artepellin C, besides standardization of the biological activities. In Europe, a similar initiative was made to characterize a standardized propolis composed mainly of substances bee collect from buds of poplar trees (*Populus* spp.).

The standardized propolis extract developed and produced in Brazil has gone through various tests to determine its biological activity, showing its efficacy, and determining the useful dosages in antimicrobial activity models, with gram-negative and gram-positive bacteria, and pathogenic yeasts (Candidiasis). Other evidence of greater relevance for COVID-19 was obtained in animal models of immunoregulatory and anti-inflammatory

Collecting propolis strips in the apiary. Note that hive boxes are not painted. They are soaked in hot linseed oil and/or other non-contaminating materials to preserve the wood and avoid contanminating the propolis when harvested.

Strips of green propolis brought in from the field.

A single strip of propolis, showing the holes that the bees leave to allow passage.

activity, showing that propolis can reduce the production of the inflammatory IL-6 and TNF-alfa, and increase the levels of the regulatory cytokine IL-1. Tests made in human macrophage cultures also showed that propolis can inhibit the inflammasome, a key problem in diseases such as rheumatoid arthritis, lupus, and other autoimmune diseases. This type of data helps support our hypothesis that consuming propolis could aid in minimizing the pathogenic effects of COVID-19.

A clinical safety trial was made with the standardized propolis extract at a dose of 375 mg/day, with no adverse effects. Also, a study was made to determine if this extract interfered with or interacted with medicines, analyzing the principal hepatic enzymes. The results showed that this standardized propolis product is safe, with no risk of interaction with treatment medicines, based on World Health Organization criteria.

We hope that this text and the review paper (reference 2 below) helps the public and medical personnel understand why propolis can be a valid adjunct treatment for COVID-19 and its comorbidities. Propolis extracts in Brazil graduated from homemade extracts sold by a few beekeepers door-to-door in the 1970s to a product that for decades has been the main livelihood of hundreds of beekeepers and is sold in every pharmacy in Brazil and extensively exported. Though vaccines for COVID-19 are thankfully now available and are being applied throughout the world, propolis will continue to be a useful option as an adjunct treatment for reducing the impact of this and other diseases in Brazil and in other countries where it is a recognized "functional food". BC

Acknowledgements Much of the research mentioned in this text and in the revision on propolis for COVID-19 (reference 2 below) involving the authors of this report was financed by the Brazilian state and federal government finance agencies FAPESP (**https://fapesp.br**), CAPES (**https://www.gov.br/capes/pt-br), FINEP (http://www.finep.gov.br/**), CNPq (**https://www.gov.br/cnpq/pt-br**) and by the bee product company Apis Flora (**https://www.apisflora.com.br/**). The clinical trial of propolis for COVID-19, conducted at Sao Rafael hospital in Salvador, Bahia, Brazil, was financed by Apis Flora and by the D'Or Institute for Research and Education (**https://www.rededorsaoluiz.com.br/instituto/idor-eng**).

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2. Berretta AA, Silveira MAD, Cóndor Capcha JM, De Jong D. (2020). Propolis and its potential against SARS-CoV-2 infection mechanisms and COVID-19 disease: Running title: Propolis against SARS-CoV-2 infection and COVID-19. *Biomedicine & Pharmacotherapy* 131: 110622. **http://doi:10.1016/j.biopha.2020.110622**. (A revision with 256 references, demonstrating that propolis has potential as an adjunct treatment for COVID-19 – this article has been the most widely accessed on the Biomedicine & Pharmacotherapy journal site for five months)
3. Silveira M, Teles F, Berretta AA, Sanches TR, Rodrigues CE, Seguro AC, Andrade L. (2019). Effects of Brazilian green propolis on proteinuria and renal function in patients with chronic kidney disease: a randomized, double-blind, placebo-controlled trial. *BMC Nephrology* 20: 140. **https://doi.org/10.1186/s12882-019-1337-7** (Results of a clinical trial

Propolis processing tanks at Apis Flora, a pioneer among the hundreds of companies in Brazil that produce propolis products for local and foreign markets.

Analysis and quality control lab for bee products at one of the Apis Flora production facilities (such analyses are necessary for the ISO 9000 qualification process). All raw materials are analyzed before going into production.

that used propolis to treat chronic kidney disease – it reduced proteinuria and improved liver function).

4. Silveira MAD, De Jong D, dos Santos Galvão EB, et al. Efficacy of propolis as an adjunct treatment for hospitalized COVID-19 patients: a randomized, controlled clinical trial. **https://www.medrxiv.org/content/10.1101/2021.01.08.20248932v1** (Results of a clinical trial of propolis – patients using propolis spent less time in the hospital and had less kidney damage, which is a common consequence of COVID-19).

Other recent publications that discuss propolis as a treatment option for COVID-19:

Bachevski D, Damevska K, Simeonovski V, Dimova M. (2020). Back to the basics: Propolis and COVID-19. *Dermatologic Therapy* 33: e13780. **https://doi.org/10.1111/dth.13780**

Fiorini, A. C., Scorza, C. A., de Almeida, A., Fonseca, M., Finsterer, J., Fonseca, F., Scorza, F. A. (2021). Antiviral activity of Brazilian Green Propolis extract against SARS-CoV-2 (Severe Acute Respiratory Syndrome - Coronavirus 2) infection: case report and review, *Clinics (Sao Paulo)* 76: e2357. **https://doi.org/10.6061/clinics/2021/e2357**.

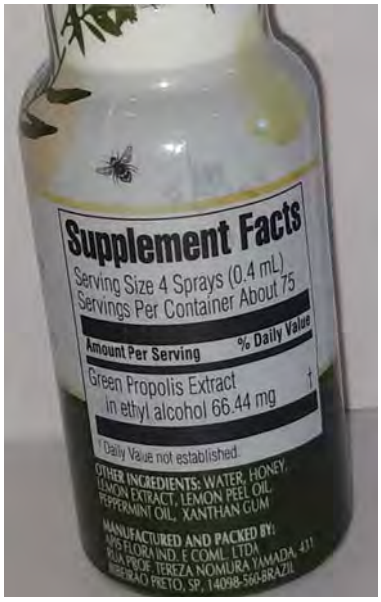
Lima WG, Brito J. da Cruz Nizer WS. (2020). Bee products as a source of promising therapeutic and chemoprophylaxis strategies against COVID-19 (SARS-CoV-2). *Phytotherapy Research PTR*: 10.1002/ptr.6872. **https://doi.org/10.1002/ptr.6872**

Miryan M, Soleimani D, Dehghani L. *et al.* (2020). The effect of propolis supplementation on clinical symptoms in patients with coronavirus (COVID-19): A structured summary of a study protocol for a randomised controlled trial. *Trials* 21: 996. **https://doi.org/10.1186/s13063-020-04934-7**

Sahlan M, Irdiani R, Flamandita D, Aditama R, Alfarraj S, Ansari MJ, Khayrani AC, Pratami DK, Lischer K. (2021). Molecular interaction analysis of Sulawesi propolis compounds with SARS-CoV-2 main protease as preliminary study for COVID-19 drug discovery. *Journal of King Saud University - Science* 33: 101234. **https://doi.org/10.1016/j.jksus.2020.101234**

Scorza CA, Gonçalves VC, Scorza FA, Fiorini AC, de Almeida AG, Fonseca M, Finsterer J. (2020). Propolis and coronavirus disease 2019 (COVID-19): Lessons from nature. *Complementary Therapies in Clinical Practice* 41: 101227. **https://doi.org/10.1016/j.ctcp.2020.101227**

Propolis extract (dried) in capsules. This product was used in successful clinical trials for chronic kidney disease and for hospitalized COVID-19 patients.



Green propolis mouth spray with lemon and peppermint oil packaged in English for a foreign company. Similar products, some with medicinal herb extracts, are found in every pharmacy in Brazil. Propolis mouth spray ingredients label. Note that this product is labeled as a supplement, which is common in Brazil.

Summer Reading –

Honey For Dummies. C. Marina Marchese and Howland Blackiston. Published by John Wiley & Sons, www.wiley.com. ISBN 978-1-119-78093-9. Also available as an E-Book. 333 pages, soft cover, color photos in center section. $24.99 available wherever books are sold.

Marina is the creater of the American Honey Tasting Society, author of *The Honey Connoisseur* (with Kim Flottum) and *Honey Bee, Lessons From An Accidental Beekeeper*, and is also founder of the Red Bee Honey brand. Howland is the author of several editions of *Beekeeping For Dummies*, and *Building Beehives for Dummies*.

The book that Marina and I put together several years ago, *The Honey Connoisseur*, had to do with selecting and pairing 30 different varietal honeys, which is Marinas forte in this genere. My contribution was to look at the plants that produced those honeys – where and how they grew, and how the terroir of the environment affected the resulting honey.

The next step, of course, is going past the basics of just honey, which Marina explores in grand detail, and Howland takes his experience in basic and advanced beekeeping and bee biology to produce a book all about honey, and how it is made, and how to use it. There is more here about honey than I have ever seen in a single production.

For those unfamiliar with honeys, and about the bees that produce them, for the first third of the book they offer an overview of the history of beekeeping from around the world, plus a summary of the biology of how honey is made by the bees, and the different techniques used to harvest and process, or not, by the beekeeper. They next take on the global issues of adulterated honey, certainly a thorny subject and look at transhipping, country of origin issues, blending different honeys, and government descriptions of honey, which are still woefully lacking.

Marina is a world class honey tasting expert, learning from experts in Italy and other locations, and has been teaching honey tasting for several years now, so it's no surprise what's next. She explores which honeys to taste, the tools you'll need, how to create tasting notes, and measure the affects of colors, smells and textures.

She then explores the terroir of where the honey was produced, or rather, where the plants the honey came from were growing. The geology of the location, the weather, and even the effects of seasonal rain and sun on the honey. All of these, and more, affect the final outcome of the flavor of a honey, and this year may be different than next because of these microenvironmental influences.

And what can go wrong with a honey? Lots. Overheated, mixing in brood, too much smoke, plastic containers, crystallization, and fermentation all should be avoided, and what happens to your honey when you don't.

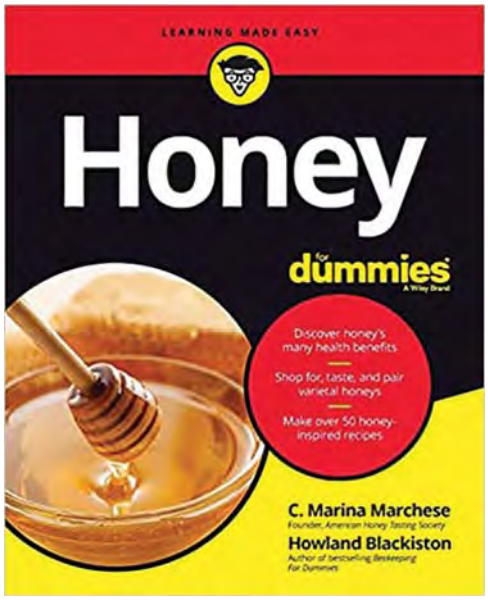
I enjoy a good mead, and over the years have looked at several books on the how-to of this, ummmm, interesting product of my honey bees. The history, types, tools and language of mead making are spelled out, here, too.

This is followed by almost 60 pages of using honey in recipes of any and all kinds, including several pages of alcohol drinks using honey. Be careful out there.

And the last four chapters are called the parts of 10. Ten great honey festivals, from Oregon to New York City, then the ten most asked questions about honey not already covered, including does honey spoil, honey and allergies, and what is grade A honey, plus more. Next are ten honeys for your bucket list. I'm already looking for some of these. In the front there's also a list of the specifics of 50 different honeys, and in the appendices they have a detailed glossary, and pages and pages of resources.

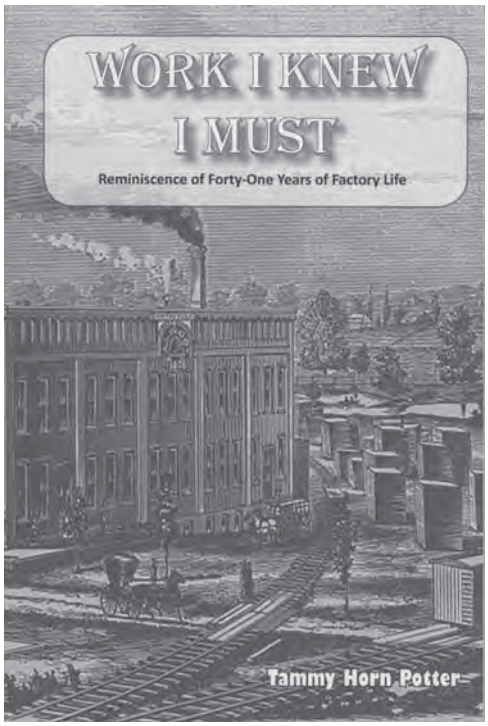
If you have honey in your life, you need this book right next to you on your desk. It is the final word in our world of honey.

Kim Flottum



Work I knew I must. Reminiscence of Forty-One Years of Factory Life. Tammy Horn Potter, with assistance from Jane Cole and A.I. Root. Published by the A.I. Root Company. ISBN 9 780984 691531. 184 pgs., black and white, soft cover $29.95 (special introductory price of $20) Visit **www.beeculture.com**.

Jane Cole worked for the A.I. Root Company for 41 years, starting when A.I. Root was making jewelry in his factory on the Town Square, in Medina, Ohio. She worked through the construction of the new factory built on the Country Fair Grounds on the edge of town to manufacture beekeeping equipment, and the many, many factory expansions they made after that. During those 41 years she did almost every job that could be done in a factory that sawed wood, made smokers, extractors, bottled honey, printed a magazine and books, and took orders and filled orders and delivered orders to customers, the railroad and the post office. She did everything from sweeping the floor to being a general manager of several of the areas of the factory. And when she retired, she wrote her autobiography about those 41 years.



She started her story right after finishing high school, when she married. The man she married was dangerous, and difficult to live with. They moved often, starting over every time. She learned to teach, but because of moving so often didn't get to do that enough for a career. She divorced, and moved home, back to Medina, Ohio. There, she took the job working for A.I. Root.

She wrote about building the new factory, child labor, factory dangers (and there were many), factory politics, noon prayers, the hundreds of people she worked with over the years, the company sponsored picnics, the men, women and children she was in charge of, and the people she worked with, and for. Often she was laid off from work during the slow season, but because she was so good at what she did, was kept on parttime when many had no job at all. She wrote about factory life, from the perspective of someone who worked in the factory and knew how difficult it was, and how to manage people and what it was like to be managed by mostly good but sometimes difficult employer.

Of course the factory was owned and operated by A.I. Root, who discovered bees and beekeeping and L.L. Langstroth in the late 1800s. While working in his factory on the town square, from a second story window he watched a swarm fly by, and asked one of his employees who saw it too if he could capture those bees and bring them back in a box, for a dollar – not knowing that that employee was, in fact, a beekeeper. He did, and because of that changed the world of beekeeping forever.

When A.I. Root retired, he, too, wrote an autobiography, about running the factory that Jane Cole worked in.

What Tammy has done is take Jane Cole's work and stand it side by side with A.I. Root's work to give you a very unique look at factory life, from the perspective of an employee, and her employer. Many of the events Jane found worthy of writing about were also mentioned by Root in his work. Because neither was aware of the other's work, the telling of these events is about as straight forward from each as you can imagine.

The story Tammy as sewn together tells much about early beekeeping history and equipment, the evolution of factory equipment and science, about working as a single woman in what is mostly a man's world, and about life in a small town in northeast Ohio at the turn of the century. You will not find a book like this, I believe, anywhere, ever. John Root, 4th Generation Root family, and Root Company leader for many years said "it is a rare opportunity to have two visions of the same experience presented together such as this book offers. It's when the two collide, that there is the best of both worlds in a story unlike any I have ever read." – *Kim Flottum*

Enjoy!

FOUND IN TRANSLATION

News From The Management

Jay **Evans**, USDA Beltsville Bee Lab

It is Pollinator Week and beekeepers in the Northern Hemisphere are happily watching their colonies in one of the most productive and healthy times of the year. Life is Good! To help keep it that way, numerous research groups have developed research-based criteria for Best Management Practices (BMPs) for honey bee health and productivity. The below studies used either side-by-side trials with different management practices, beekeeper surveys, or meta-analyses of hundreds of individual studies to come up with lists of key BMPs. It is fascinating to see the commonalities as well as the times when some practices are favored by one analysis and disfavored by others. In the end, conventional knowledge holds up well, i.e., mites must be addressed and hive monitoring for size, food stores, and incipient disease are all important. But, for those of us with mortal needs and distractions, or a large number of colonies, it is helpful to rank *which* practices are most important.

On the experimental side, Lewis J. Bartlett and colleagues in Georgia and the United Kingdom have produced two papers that mix direct experimentation and knowledge about how diseases spread to shed light on good things beekeepers do, and things to avoid. The first paper is one for the theory folks. Here the authors apply two successful models of disease dynamics to predict disease risk at the colony, apiary, and population levels when changing apiary size and colony positions (Industrial bees: The impact of apicultural intensification on local disease prevalence, *Journal of Applied Ecology*, 2019, **DOI: 10.1111/1365-2664.13461**). Surprisingly, the disease impacts (parasite or pathogen growth) of increasing apiary size from nine to hundreds of colonies are not too bad. For disease agents with high growth rates, presumably the very ones that hurt bees the most, the authors predict that local densities will not in and of themselves greatly impact the risks. In a follow-up study in which the authors measure known bad actor (viruses), Bartlett and colleagues *did* see some changes in disease loads with the degree of 'management'. In a nicely planned set of experiments ("Persistent effects of management history on honeybee colony virus abundances", *Journal of Invertebrate Pathology*, 2021, **https://doi.org/10.1016/j.jip.2020.107520**), they assessed virus loads in colonies with different histories that were grouped together in the same environment. Specifically, one-third of colonies were 'feral' (e.g., collected as swarms in remote parks), one-third were from low-management operations (e.g., no large-scale movement and at densities and scale equal to sideliners or hobbyist beekeepers), and one-third were from high-management operations (e.g., large apiaries and management consistent with commercial beekeeping). Once settled in adjacent but non-interacting apiaries, colonies were treated identically. A year later, viral loads were assessed. While colonies show the typical breadth of viruses, levels of viruses trended higher in high-management versus low management colonies for all virus species, even those viruses not moved around by *Varroa* mites. As expected, based on their genetics and isolation, colonies from 'feral' sources showed generally lower viral loads, with the possible exception of sacbrood and Lake Sinai viruses, neither of which relies on mite transport for bee-to-bee movement.

In a related study exploiting the same colony sources, it was found that mites from feral sources were slower to increase in abundance *even in colonies from the other two populations*, suggesting the potential for mite evolution in response to bee management (Travis Dynes and colleagues "Assessing virulence of *Varroa destructor* mites from different honey bee management regimes", 2020. *Apidologie*, **https://doi.org/10.1007/s13592-019-00716-6**). Collectively these studies shed light on the complex pressures facing bees, mites, and their hitch-hiking viruses under different population and management schemes. While colony loss studies have shown that colony loss rates for commercial beekeepers are no higher than those of small-scale beekeepers, these studies also suggest that, given identical management, this need not be the case. Commercial beekeepers might be reducing their losses through more intensive, or more effective, disease control. So, what are the key management decisions that actually help bees thrive?

Giorgio Sperandio and colleagues (in "Beekeeping and honey bee colony

health: A review and conceptualization of beekeeping management practices implemented in Europe", 2020, *Science of the Total Environment*, **https://doi.org/10.1016/j.scitotenv.2019.133795**) take a deep dive into which beekeeping practices are most essential for colony health and productivity. To do this, they surveyed peer-reviewed data for all types of bee risk and management strategies and came up with a ranking of which processes were most likely to both impact bee health and be adopted by beekeepers. They settled on six feasible BMPs; 'Chemical control of mites', 'Replacement of combs with brood', 'Replacement of combs with feed sources', 'Supplementary feeding', 'Beekeeper category and experience', and 'Change in the number of workers'. Two of these strategies involve evening out colony numbers among hives in an apiary, two involve giving hungry bees a boost, and one involves mite control. The authors argue that if these worries are addressed beekeepers will gain more bees for their effort. While they did not go on to implement their recommendations, they did an extensive literature search, and consulted with experts, to build confidence that these six changes will indeed lead to healthier apiaries.

Finally, Kelly Kulhanek and a wide-ranging team of experts pored through the impressive data resources of the Bee Informed Partnership for clues into which practices were most effective for small-scale beekeepers aiming to keep their colonies healthy. In their paper "Survey-derived best management practices for backyard beekeepers improve colony health and reduce mortality" (2021, *PlosOne,* **https://doi.org/10.1371/journal.pone.0245490**), they identified four practices carried out by successful beekeepers and labeled these (appropriately) BMPs. These BMPs were to re-use equipment from dead-out colonies immediately, to monitor mite levels monthly prior to making treatment decisions, to start new colonies from splits or nucleus colonies rather than packages, and to freeze older comb prior to re-use in colonies. Bravely, they tested their predictions by managing several apiaries either as an 'Average' beekeeper or as a 'BMP-informed beekeeper'. As in almost all colony studies, the bees faced successes and tragedies that were independent of the studied factors, so the results were not completely distinct. Fortunately, the researchers had the patience to manage and study colonies for three entire years, and over this timeframe the BMP cohort pulled away. For many standard measurements used to assess colony health, including frames of brood, frames of bees, even 'brood quality' and queen issues, the management regimes were indistinguishable. However, the colonies treated with BMP techniques carried 25% fewer mites over the study (averaging 2.67 mites/100 bees versus 3.62 mites/100 bees in the colonies with 'Average' management). Not surprisingly, given the BMP efforts to keep mid-season mite numbers in check, levels of four mite-vectored viruses were also lower in the BMP colonies. *Nosema* levels did not differ with respect to colony management.

So what did the study reveal about the net gains and losses from beekeeping with a BMP or 'Average' mindset? Most importantly, BMP-treated colonies were far more likely to survive Winter, with 'Average' beekeeping leading to a 50% increase in Winter losses (from 31% to 45%). Fortunately, these benefits were the same for beekeepers in several different environments ranging from southern to northern U.S. Along with not having to replace lost colonies, beekeepers following this BMP regime are expected to have a higher number of colonies from which they can make profitable splits. Across the study, 79 colonies were identified as splittable in the BMP cohorts versus only 46 colonies under 'Average' management. As another reflection of longterm gains from subtle differences in individual bee health, this difference in splitable colonies was only significant in the third year of study. Patience in these practices is a virtue, you might see health gains in your first Fall or Winter, but in reality you have to be in it for the long haul in order to benefit from BMP practices. Finally, the authors showed there is still much room for improvement. Losses in colonies given all the love of BMP principles were still surprisingly high. Insights from beekeepers and researchers are still needed to curb that loss rate, so keep your eyes open for new BMPs on the horizon. BC

A Closer Look

HONEY BEE POLLINATION

Clarence **Collison**

Sex Between Flowers

Pollination is the process by which pollen is transferred from the male to the female parts of flowers, thereby enabling fertilization and sexual reproduction. Self-pollination occurs when pollen is transferred from the anther to the stigma of the same flower, other flowers on the same plant or other plants of identical genetic material (clones). Whereas, cross-pollination occurs when pollen is transferred from a flower of one plant to a flower on another plant that is not genetically the same. "Pollen can be transferred by wind or water, but many plants rely on insects to pollinate their flowers. Pollination by honey bees occurs because of the behaviors of foraging bees and the reproductive strategies of plants. Foraging occurs when flowering plants are in bloom and weather conditions are suitable for bee flight. Honey bees will forage a particular plant species when there are enough open and rewarding flowers to enable foragers to gather resources of greater caloric value than the bees expend collecting them (DeGrandi-Hoffman 2015)."

"Honey bees are well known for producing honey, but they also provide critical ecosystem services through pollination (Potts et al. 2010). While the demand for pollination services have been increasing, continued declines in honey bee colonies have put the cropping sector and the broader health of agro-ecosystems at risk (Ritten et al. 2018)." "Pollinators are required for producing 15-30% of the human food supply, and growers rely on managed honey bees throughout the world to provide these services. Yet honey bees are not always the most efficient pollinators of all crops and are declining in various parts of the world. Crop pollination shortages are becoming increasingly common (Greenleaf and Kreman 2006)."

"Each year, millions of commercial honey bee colonies are moved throughout the United States for the pollination of crops. Moving honey bee colonies for pollination is essential for the production of crops that comprise more than one third of the U.S. diet. It is necessary to move colonies into fields and orchards for pollination because there are usually not a sufficient number of native pollinators (honey bees and non-*Apis* bees) to fully pollinate the crop (DeGrandi-Hoffman 2015)." To date, no commercially satisfactory substitute for bee pollination has been found for any major insect-pollinated crop. Adequate pollination results in increased yields, faster maturing fruit, larger, better shaped fruit and possibly increased sugar content. The number of colonies needed will depend on the location, attractiveness of crop, flower density, length of blooming period, colony strength, competitive plants in the area and the number of native pollinators present. Each crop and often varieties of a crop have unique characteristics which may require different pollination approaches.

"The production of fruits and seeds of many crops is increased when bees visit their flowers pollinating them. Nicodemo et al. (2009) studied the pollination of pumpkins (*Curcurbita maxima* Duch. Var. Exposicão), to determine the diversity of insects visiting its flowers, the time and type of provision obtained and the effect of the visits on fruit set, fruit size and weight, and number of seeds. Honey bees accounted for 73.4% of the visits made by bees, collecting pollen during 34.5 seconds per flower and nectar in 43.9 seconds and 29.3 seconds from female and male flowers, respectively. *Trigona spinipes* (Fabr.) (a stingless bee) collected only nectar, during a mean time of 60.5 seconds per flower and represented 26.6% of the visits by bees. When no insect visits occurred, there was no production of fruits. In the flowers with free visitation by insects, fruit set was 40%. The higher the number of visits, up to 16 by honey bees to female flowers, the greater was the fruit set, fruit size and weight, and number of seeds. In flowers visited by insects from the onset of anthesis (opening of the flower) until 9:00 A.M., fruit set was 35%. After 9:00 A.M., there was no fruit set, demonstrating the important role of honey bees as a pollinating agent of pumpkin, since it was the only insect visiting up to 9:00 A.M."

"Walters and Taylor (2006) measured honey bee impact on seed set, fruit set and yield of jack-o-lantern (*Cucurbita pepo* L.), large-sized (*C. maxima* Duch.) and processing pumpkins (*C. moschata* Duch. Ex Poir) under field conditions. There were sufficient natural pollinators [including bumblebees (*Bombus* spp.), carpenter bees

(*Xylocopa* spp.), honey bees and squash bees (*Peponapis pruinosa* Say)] provided under field conditions to induce fruit set of jack-o-lantern pumpkins as fruit number obtained per hectare was not affected by the addition of a honey bee colony. However, the addition of honey bees did increase fruit number per hectare of the *C. moschata* and *C. maxima* cultivars evaluated. Honey bee pollination resulted in larger-sized fruit, increasing individual fruit size of all but small-sized pumpkins (<0.5 kg). Individual pumpkin fruit weights of the *Cucurbita pepo*, *C. moschata* and *C. maxima* cultivars evaluated increased by about 26%, 70%, and 78%, respectively, when honey bee colonies were included. Natural pollination was insufficient to stimulate maximum fruit size development and seed number and seed weight per fruit. Although pumpkin fruit set will occur with natural pollinators, the addition of honey bee colonies will ensure the presence of pollinators to maximize fruit size. Since pumpkins are generally sold on a weight basis, growers may generate greater revenues with the addition of honey bee colonies in pumpkin fields."

"Chagnon et al. (1989) determined the influence of the number of visits by the honey bee on the pollination rate of strawberry (*Fragarla x ananassa*, Duch.) flowers. Pollination rate is defined as the number of fertilized achenes divided by the total number of achenes per berry. 'Veestar' cultivar plants were caged before flowering began and cages were opened to observe bee visits. The cumulative effect of the number and length of visits to these flowers significantly increased the pollination rate. Four visits with a total of approximately 40 seconds of foraging were required for adequate pollination. In the absence of pollinators, primary flowers had lower pollination rates than secondary and tertiary flowers. Pollen transported by bees is thus particularly important for optimal development of these first berries harvested for market."

"Honey bee visits to watermelon flowers were mechanically controlled to determine how many were needed to pollinate a single flower. Although there was some fruit development even after only one visit, eight visits were considered the minimum required for normal development. There was a positive relationship between fruit set and ovary length. Fruit set following bee visitation generally increased from 6 to 9 AM and from 6 to 10 AM following hand pollination. According to the method of measurement used, field bee populations exceeded the minimum necessary for fruit set in two years of observation. Honey bees were used at the rate of one colony per acre (Adlerz 1966)."

"Honey bees are important pollinators of triploid watermelon [*Citrullus lanatus* (Thunb.) Matsum & Nakai]. Pistillate (or female) watermelon flowers require multiple honey bee or other wild bee visitations after visiting staminate (or male) flowers for fruit set, and pollination is even more of a concern in triploid watermelon production since staminate flowers contain mostly nonviable pollen. Six honey bee visitation treatments – 1) no visitation control, 2) two visits, 3) four visits, 4) eight visits, 5) 16 visits, and 6) open – pollinated control – were evaluated to determine the effectiveness of honey bee pollination on 'Millionaire' watermelon fruit set, yield and quality utilizing 'Crimson Sweet' at a 33% pollenizer (viable pollen source) frequency. 'Millionaire' quality characters (hollow heart disorder or percent soluble solids) did not differ between honey bee pollination treatments. The open-pollinated control provided the highest fruit set rate (80%) and the greatest triploid watermelon numbers and weights per plant compared to all other honey bee visitation treatments. Fruit set and fruit numbers and weights per plot increased linearly as number of honey bee visits to pistillate flowers increased from 0 (no visit control) to the open-pollinated control (about 24 visits). This study indicated that between 16 and 24 honey bee visits are required to achieve maximum triploid watermelon fruit set and yields at a 33% pollenizer frequency, which is twice the number of honey bee visits required by seeded watermelons to achieve similar results. This is probably due to many honey bees visiting staminate triploid watermelon flowers (that are in close proximity) before visiting pistillate flowers, thus providing mostly nonviable pollen that is useless for fruit set and development. Therefore, more honey bee visits to pistillate triploid watermelon flowers would be required to achieve maximum fruit set and subsequent development compared to seeded watermelons (Walters 2005)."

"In a two-year field study, mature orchard plants of rabbiteye blueberry (*Vaccinium ashei* Reade variety 'Climax', plus potted pollenizers ('Premier') were caged with varying densities of honey bees (0, 400, 800, 1,600, 3,200, 6,400, or 12,800 bees plus open plot) during the bloom interval (Dedej and Delaplane 2003). The rate of legitimate flower visits tended to increase as bee density increased within a range of 400-6,400 bees; there were more legitimate visits in cages with 6,400 bees than in those with 1,600 bees. Similarly, within a range of 400-6,400 bees there was a trend for a corresponding increase in fruit-set with means ranging from 25.0 to 79%.

Fruit-set was higher in cages with 6,400 or 3,200 bees than in those with 800 bees. Regression analyses showed that fruit-set increased linearly with the rate of legitimate bee visits. Mean weight of berries was unaffected by bee density but varied significantly between years. Within a range

of 0-3,200 bees/cage the average seeds per berry tended to increase with increasing bee density; there were more seeds in open plots than in cages with 12,800 honey bees or 1,600 bees. Sucrose content ranged from 12.1 to 16.7% and fruits tended to have more sugar in cages with lower bee densities. Speed of ripening tended to be higher in cages with higher bee densities. Earlier work has shown that the effectiveness of honey bees as a pollinator of rabbiteye blueberry is variety-dependent. The data of this study indicated that the effectiveness of honey bees is also density-dependent."

"Avocado (*Persea americana*) is an important tree crop globally, and the fruit have high nutritional value. Fruit-set percentages in avocado are typically less than 0.3%, while hand-pollination often achieves about 5% fruit set. This suggests that fruit set could be limited by insufficient pollination. Pattemore et al. (2020) investigated pollination processes in avocado orchards in Australia and New Zealand in order to understand whether poor pollination was limiting avocado production. They recorded no pollen deposited on more than 80% of all female flowers. While receptive female flowers were visited multiple times by potential pollinating insects, few of them carried more than 100 pollen grains (e.g., just 6% of flower-visiting honey bees. Honey bees, bumble bees (*Bombus* spp.) and flies caught off either pollenizer male-phase flowers or 'Hass' female-phase flowers carried different amounts of avocado pollen grains, suggesting that differences in behavior between pollinator species may affect the rate of pollen movement between pollenizers and 'Hass' flowers. Improving the rate of pollen movement between cultivars and deposition in avocado orchards is critical to ensure that pollination does not limit fruit production."

"Maine is the largest producer of wild blueberry (*Vaccinium angustifolium* Aiton) in the United States. Pollination comes from combinations of honey bees, commercial bumble bees (*Bombus impatiens* Cresson), and wild bees. Bushmann and Drummond (2020) sampled bee communities in 40 fields over three years (2010-2012) and bee activity densities were estimated for bumble bees, honey bees, and other wild bees. These data were applied to an economic model to estimate the value of bee taxa. Bumble bees and honey bees predicted fruit set and reduced its spatial heterogeneity. Other wild bees were not significant predictors of fruit set. Yield was predicted by fruit set and field size, but not pest management tactics. Their analysis showed that disruption in supply of honey bees would result in nearly a 30% decrease in crop yield, buffered in part by wild bees that provide "background" levels of pollination. Honey-bee stocking density and, thus, the activity density of honey bees was greater in larger fields, but not for wild bees. Therefore, a decrease in crop yield would be greater than 30% for large fields due to the proportionally greater investment in honey bees in large fields and a relatively lower contribution by wild bees." BC

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All The Buzzz in...

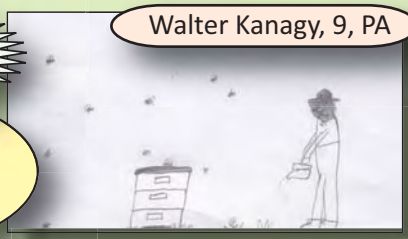
Hello Friends,

Summer is here! I wish you many outdoor adventures this month.

Bee B.Queen

Bee B. Queen Challenge

Take a photo of a bee on a plant.



Walter Kanagy, 9, PA

Martha Mae Kauffman, 11, OH

Plant an Herb Garden

Herbs are easy to grow, beautiful, fragrant, and useful for both pollinators and people.

Pollinators, including honey bees, gather nectar from flowering herbs. The bees turn the nectar into honey to use as their energy food. Bees also need the honey so they can produce wax from a wax gland in their abdomen to build their comb.

People benefit from herbs in many ways. We can eat them, use them for medicine, make crafts, smell them and just enjoy their beauty. Herbs can be used in cooking and to make flavorful teas. Basil adds so much to pizza and pasta. Rosemary compliments potatoes. Mint can be made into tea to help with digestion. Catnip can be used to make toys for cats to enjoy. The scent of lavender adds so much to a sachet or bath water.

Plant some herbs. You and the bees will be glad you did!

How to Plant an Herb Garden

1. Find a sunny spot in your yard. Grow herbs in pots or directly in the ground.
2. Many herbs have flowers that attract bees. Go to the word search on the opposite page to see a list of herbs that bees love.
3. Herbs like to be shared. Ask neighbors, family, and friends for herb cuttings and plants. You can also buy plants at a nursery. Herbs that grow great from seeds include basil, coriander/cilantro, dill and fennel. Once you get your garden going, you can share your plants with others.
4. Herbs like good drainage so add plenty of compost to clay soil or place stones at the bottom of pots before adding potting mix.
5. Give the plants plenty of room to grow. Rosemary will grow into a bush. Mint needs room to spread.
6. Learn more about caring for your herb garden by checking out books at the library or researching on the internet.
7. Don't forget to use them. Surprise your family and friends with an herbal bouquet. Make refreshing summer teas. Learn to cook with the herbs in your garden. Make dream pillows, rosemary swags, or bath herbs.

Thyme

... Bee kid's corner

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

Make a Sachet

1. Make a small bag using cotton fabric.
2. Mix dried herbs to fill the bag. Use fragrant herbs like lavender, lemon balm, mint, rosemary, and thyme.
3. Add a few drops of essential oil.
4. Fill the bag with the herbs.
5. Sew or glue the bag closed or tie the top tightly with ribbon or string.


Fennel


Borage


Rosemary

Herbs That Bees Love Word Search

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

Basil
Bee balm
Borage
Catnip
Chamomile
Coriander
Fennel
Lavender
Lemon balm
Mint
Rosemary
Sage
Thyme


Basil

Bee Buddies

The Ragans, from Florida, started their beekeeping adventure about a year ago. Eleanor, age 2 and Henry, age 5 have been involved and interested every step of the way! Henry specifically asked to be a Bee Buddy when the family made the Energy Bites in the February issue. "We loved making and eating them!"

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.

Grant Money To Start Beekeeping

Jon **Zawislak**

Government agencies, private entities and virtuous citizens have all been concerned for the plight and peril of pollinators for over a decade now. Since CCD entered our vocabulary in 2006 we have seen alarming headlines with gloom and doom predictions for the disappearing honey bee, and by extension, the end life as we know it. Many have considered picking up a hive tool and trying their hand at beekeeping, and it has taken on a new image. No longer a quaint pastime for bearded old men named Burt, tending bees is a trendy way to hold Mother Nature's hand while you help save the planet. Celebrities like Morgan Freeman, Scarlet Johansson and Leonardo DiCaprio keep bees. Guitar wizard Steve Vai and funky bass thumper Flea have joined our ranks. Michelle Obama had a hive installed in her white house vegetable garden. The Pope has a number of hives at what has been the Vatican's Summer residence since the 16th century. Even the fictional sleuth Sherlock Holmes has helped to popularize the hobby.

But, as you well know from experience, getting started with honey bees is not cheap. Many of the expenses are on the front end, leading to sticker shock for some who just wanted to do their part to protect and promote these invaluable pollinators. Of course, no agricultural venture comes cheap. Want chickens? Price out the feed, watering trays, heat lamps and a good coop, then calculate how much each delicious farm fresh egg is actually costing you. The same goes for bees. You may have seen the price tag on a jar of fresh local honey at your farmer's market and thought you could just bottle your own liquid gold. But then you learned that most bee colonies won't even produce a surplus crop of honey until their second year. It can take you a while to see a return on your investment in bees, but it can happen if you stick it out.

Where can you turn for help? A recurring question I receive at the Cooperative Extension office is how to get a government grant to start keeping honey bees. People complain about crooks in charge and having to pay taxes, but the same folks line up with their hands out when checks are being issued. Have you heard rumors that there is free federal cash available for bees, and wondered how you could get in on that?

The short answer is a disappointing ***no***. There is no large federal fund writing blank checks to pay citizens to start new bee hives. The long answer is ***yes***, there are numerous programs that can benefit beekeepers, either directly or indirectly.

Despite increased awareness of the plight of the humble bee, and the imperative need to maintain a healthy pollinator population, the government simply isn't going to fund your hobby interest backyard beehives any more than they will pay you subsidies to grow a tomato patch, learn to knit, take up the banjo, or collect rare stamps.

Perhaps you think they should. Pollinators benefit the environment in countless ways. And there is certainly a vested public interest in keeping honey bees around, for their agricultural and economic benefits. But given the economic state of things in the wake of the pandemic, don't hold your breath for a bee hive bailout.

"I heard there was a program…"

I receive many phone calls and emails that begin this way, so I started trying to track down the source of these rumors to see what opportunities do exist. I found some vague articles online, but trying to trace their origin leads in a circle of web pages and social media posts linking to each other and back around to where you started, with little useful information. Some stories promise plenty, but are short on concrete details. So after a few rounds of frustrating clicks on vague posts, many people will call their Cooperative Extension offices for clarification. And unfortunately, folks may not find the answer they hoped for.

It's not that public funding for beekeeping hasn't been tried. In 2005 Dr. David Tarpy, a honey bee researcher at North Carolina State University, received a grant from the Golden LEAF foundation, which funded agricultural development projects through their state's tobacco settlement. Under this program, they were able to provide pairs of hives and package bees to new beekeepers who took an introductory class and joined a local beekeeping association.

Participants still had to purchase their own protective clothing and other accessories, but that was a relatively minor expense by comparison. A couple of standard bee hive kits and two spring packages of honey bees can easily run you $600 or more in today's money. Dr. Tarpy estimates that the half-life for new beekeepers sticking with it runs about 2½ years. That is, every 2½ years, about half of those who take up beekeeping will quit for one reason or another. Another half of those who remained will be finished in another 2½ years, and so on. The initial program funded 250 individuals. So by his estimate,

there may be about four individuals from that original group who still light their smokers today.

Another annual program, administered through the Virginia Department of Agriculture, has tried to promote beekeeping by providing up to three hives to households that apply for them. Recipients are selected randomly from a pool of eligible applications received each year, with the number of hives available being contingent on recurring funding from their state's legislature. While bee hives were distributed, honey bees and other tools were not provided. Recipients were required to establish bee colonies in their new hives within one year of receipt. No data was available about the success of the Virginia program to increase the number of bee colonies in their state.

Fortunately for the bees, there are always more people who want to join the noble ranks of beekeepers every year. Unfortunately, many of them will also give up on it after a short time. But why the exponential drop-off?

There have been some other attempts to jump start beekeeping with other programs, but most have had similar results as North Carolina. Why is that? Well, you may have discovered that successful beekeeping involves work. Some chores have to be done on the bees' schedule, and not at our leisure. We endure hot weather in bee suits, heavy lifting, and those pesky stings – some people don't seem to like those. Generally speaking, when people have to invest their own funds, they are more likely to put in more effort. But when they have no financial skin in the game, it may be easier to simply shrug it off and say we tried, but that bee thing really wasn't for us.

A lot of beekeeping books and blogs, like gardening books and cookbooks, tend to present the most encouraging information – pretty flowers, smiling beekeeper families holding frames of honey, and jars of freshly bottled and neatly labeled honey that suggests a free gold mine. And like the California gold rush, people have flocked to beekeeping only to find out they can't simply pick up big nuggets from a stream by the shovel full.

Cookbooks show beautifully staged photos of delicious looking meals, with a note that says "feeds four, cooking time 10 minutes" but conveniently omit showing you how many pans and measuring cups you'll have to scrub. We love garden-fresh veggies, and many have been known to plant in the spring with the best intentions, but before long we become overwhelmed with other Summer activities, and before long the weeds are higher than the corn.

Likewise, modern beekeeping has challenges. There are mites and viruses, bacteria and beetles, fungi and failing queens, pesticides and pollution. And there are scores of books, blogs and online videos that often seem to give conflicting advice. Someone new to the craft will have to dive in and claw their way up a very steep and confusing learning curve for the first couple of years. Which is why so many will throw in their veil and try other pursuits. If you can stick it out without losing your shirt, though, you might have what it takes to succeed with honey bees.

But what about all those supposed grant programs? Most granting agencies prefer to fund projects that produce results – either practical solutions or "pure science" endeavors to increase knowledge for its own sake, which will (hopefully) lead to practical applications. And most want you to include a statement about how your results will be made public (with a little credit to themselves for their funding). Even the most generous grants rarely fund "brick and mortar" structures for you. They may help you with equipment and supplies, salary or labor, but will not simply pay you to build yourself a barn or honey house or other structure – including those relatively small structures we call beehives. Those types of real estate improvement are generally going to require your own capital since they are ultimately for your own use and convenience. And for a hobby beekeeping operation, you will have to find a way to fund your own fun.

If you are considering beekeeping on a commercial scale (large or small), you can look into a small business loan. The USDA offers a farm loan program specifically to help farmers and ranchers start up an operation, or to expand or maintain a family farm, often with low interest rates and credit terms. Adding working pollinators to an existing operation, or producing honey as a specialty crop, can qualify for this type of farm expansion. These loans can help with operating costs such as

livestock and feed, new equipment, or even family living expenses while an operation gets up and running. Farm Ownership Loans can be used to purchase a farm or ranch, to expand an existing one, or to construct or improve buildings, or even help conservation efforts to protect or improves soil and water resources.

Microloans are particularly intended for small operations and non-traditional or specialty crop operations. They may be smaller in scale, but often require less daunting paperwork. There are even special categories of funds earmarked to help Native American tribe members, youth agricultural projects, or to assist women and minorities to purchase and operate a farm or ranch. The USDA's Farm Service Agency has a Beginning Farmers and Ranchers program that can provide guaranteed credit to assist a new generation to purchase land and begin to operate in agriculture. Go to **www.farmers.gov/fund/farm-loan-discovery-tool** to see what options are available, or visit with your local FSA office to talk to a representative in person.

If you already keep bees, you know that they are most productive when they are healthy and have access to good, diverse forage. There is only so much that beekeepers can do inside the hive to help out (controlling mites and diseases, for instance). A lot of what happens to bee colonies is dictated by outside conditions, literally from the ground up. By improving habitat in areas around an apiary, we increase the bee's access to a greater diversity of flowering plants. When done right, a succession of plants can provide pollen and nectar all season long. This is especially important in the early build-up period before the main nectar flow, as well as late fall, when hives are building up their winter stores, and fattening up the brood that will become the overwintering bees. Ideally bees should be self-sustaining, but humans have often modified the environment to make that harder. So anything that improves their surroundings is a good thing.

The USDA's Environmental Quality Incentives Program (EQIP) provides financial and technical assistance to agricultural producers to address natural resource concerns and deliver environmental benefits. This voluntary conservation program helps farmers make conservation work for them. Each state has specific priorities and geographic regions they wish to target. Their Conservation Stewardship Program (CSP) helps landowners build on current efforts while strengthening existing agricultural operations. By improving grazing conditions in pastures or establishing and improving wildlife habitat, landowners can improve nutritional conditions for bees. And the Conservation Reserve Program (CRP) actually pays landowners annually to voluntarily remove land from agricultural production and plant species that improve environmental health and provide wildlife habitat.

The Natural Resources Conservation Service (NRCS) is a branch of the USDA that works with farmers and landowners to improve the quality of soil, water and air with practices that also enhance habitat for pollinators and other wildlife. Their programs can potentially benefit beekeepers by improving the forage conditions for bees. NRCS programs provide technical and financial assistance to help landowners provide safe and diverse sources of nectar and pollen for bees. This can be through planting cover crops, planting native wildflowers and grasses in buffer areas and other areas not in crop production, and improving the management of grazing and timber lands. More than three dozen NRCS conservation practices currently benefits pollinators. Contact your local NRCS office to learn more about what you can do on your property.

Individual states may also have specific initiatives. Here in Arkansas, landowners can enroll in the Acres for Wildlife program administered by the Arkansas Game and Fish Commission. Citizens and wildlife biologists work together to improve habitat by considering the needs of wildlife (including pollinators) in conjunction with good farming, livestock production and forestry practices. See what programs your own state's wildlife agencies are offering.

Another broad program called Project Wingspan is administered through numerous cooperating government agencies and private

organizations to promote and improve pollinator habitat on public and private lands. In particular, they seek to connect fragmented habitats along the monarch butterfly's annual migration route with more suitable native wildflowers. Of course, these habitat improvement efforts will make the world a better place for the birds and the bees as well the butterflies. Visit **pollinator.org/wingspan** to learn more.

Beekeepers and landowners can also benefit from talking to a Farm Bill Biologist. These specialists are trained to assist private landowners and farmers in navigating the numerous government programs. They can help tailor conservation programs specifically to your goals, and can assist you after programs have been implemented. Their one-on-one consultations are free of charge, and these experts can even make site visits and specific recommendations for your situation. To find your nearest specialist, visit **quailforever.org/Habitat/findBiologist.aspx**.

Even if you don't want to enroll in a government program, or your property doesn't qualify, you can still take advantage of free technical advice and resources from many of these agencies to help plan and implement your own conservation efforts.

The government has deep pockets and they bail out everyone else, so why not beekeepers? Well, actually they do, under some circumstances. The USDA's Emergency Assistance for Livestock, Honey Bees, and Farm-raised Fish Program (ELAP) helps these producers by reimbursing a portion of eligible losses due to adverse weather or other disasters, including blizzards and wildfires, as determined by the Secretary of Agriculture. ELAP covers losses that are not included under other disaster assistance programs, such as the Livestock Forage Disaster Program (LFP) and the Livestock Indemnity Program (LIP).

ELAP is also administered by the FSA. For more information on this and other programs, visit **farmers.gov/recover** or contact your local FSA County Office to see if your situation qualifies for this program. Good record keeping is vital to processing a claim. Take advantage of your state's Apiary inspection services. An on-site colony inspection will help you maintain clear records of colony numbers and health. Without a reliable paper trail, ELAP claim processing could be delayed or denied.

The federal Rural Business Enterprise Grant Program fund projects that will start businesses, create jobs, and inject cash into a local economy, and often center on improving community access to produce and other food. Bees can be an important component of that. Conservation Innovation Grants focus on sustainable agriculture, so you will need to demonstrate a pioneering approach to beekeeping and promoting conservation efforts.

This may be an area to consider for organic farmers looking to improve production with the addition of a pollinator workforce.

While there are technically no federal grants available specifically for beekeeping, there are many other awards and programs that can include an aspect of beekeeping. Grant programs come and go over time, and different agencies offer different types of assistance to different people and groups. All federal grants are advertised and administered through the website **grants.gov**. Users can search categories and look for things that may apply to their situation. Be prepared for a lengthy application process. These can be simple to understand, but may be very detailed in structure, and can be time-consuming to complete.

Getting started with beekeeping ain't cheap. It's a challenging activity, which is why many who take up a smoker will extinguish it within the first few years. But it can be richly rewarding. And doing it yourself will make your first jar of honey taste all that much sweeter. BC

How To Haggle On A Farm

Stephen **Bishop**

If you ever hear a farmer say, "I'm just a poor dirt farmer," you're about to be bamboozled. Don't fall for it. It's a pity-play farmers use when haggling. Just last week, I had a farmer come up to me lamenting his agricultural status, trying to get a free hive of bees. He should have known better than to try that line on a poor struggling beekeeper with a bad back.

"Poor dirt farmer?" I said, "You grow hydroponically." The farmer had recently jumped on the hydroponic bandwagon and literally left dirt behind, buying a fancy new greenhouse. It was one of those pre-packaged deals where you fork over your life savings and a greenhouse company comes out and erects the Taj Mahal of greenhouses. The greenhouse had heated concrete floors for grow pots, a computer-operated drip-irrigation system, and an automated self-rising trellis. It even came with a pallet of perlite thrown in for free.

Despite all these feats of modern technology, the farmer was still down on his luck. This isn't unheard of. We all know farmers with combines so big they need a plane hangar to park in who still consider themselves poor dirt farmers. Frankly, it's like your momma always said, "you can't judge a farm by its combine." The farmer with the 2021 edition of the GPS-guided soybean destroyer with tracks like an army tank and 50-foot cutting head may be closer to the verge of bankruptcy than the little old fella with the Gleaner circa 1978. You just never can tell.

I guess the same goes for farmers with fancy greenhouses.

"Can't you just bring a bee box over here and set it inside?" the farmer asked. "I got all sorts of strange-looking cukes. I've been trying everything, even tickling the cucumber blooms, but my fingers are too fat."

"Honey bees aren't usually used for greenhouse pollination," I told the farmer. "You need bumble bees for that."

"Where do you get bumble bees from?" he asked.

"Don't know," I said.

"Well, can't you just bring a box of bees over here and give it a try?" he pleaded.

With no bees to properly pollinate his high-tech indoor greenhouse, his cukes looked like crooked-neck squash, albeit green and shriveled. It's really fitting that just when a man thinks he's triumphed over Mother Nature and can grow food without dirt, he's brought back down to earth by bees. It happens to the best of us, even beekeepers. In fact, somehow last year I managed to grow a watermelon in a clogged-up gutter. Upon noticing the feat, the next day I stepped on a bee barefooted and had to stop, drop, and roll back down to earth. Thus, I wasn't entirely insensitive to the farmer's plight and said –

"Well, I'm just a poor struggling beekeeper with a bad back. I can't just be toting beehives every ole place and not getting recompense."

"What will it take?" he said. "My fingers have been cramping for days. I'm seeing cucumber blossoms in my sleep."

"Well, I do like pickles," I said, "so maybe a heaping bucket of cukes will do."

"Alright I reckon I can agree to a bucket of cucumbers," he said.

"Five-gallon bucket?" I asked.

"Two two-gallon buckets," he said.

"Heaping?" I asked.

"One heaping; one level," he said.

"Alright," I said, "deal."

We shook on it, and there you have it, that's how farm haggling is done. Of course, we both thought we'd gotten the better end of the deal. But, to be honest, it was a pretty fair trade: He gave me two buckets of his worst, most misshapen cukes. I gave him my meanest hive. BC

Stephen Bishop is a poor struggling beekeeper with a bad back. You can see more of his humor writing at misfitfarmer.com or follow him on Twitter @themisfitfarmer. You can check out John Martin's beekeeping cartoons at beezwaxcomic.wixsite.com/beeswax.

Renewal Time For Me

John **Miller**

Since our last visit, I've mused not only on 'letting go' – but on Renewal.

I'm not writing about miracle cures, miracle ears, miracle hair growth.

A recent Wall Street Journal section addressed *Are You Ready for Retirement?*

Thankfully, I am offered work at Miller Honey. I help with the almond run, my area is Modesto. I get about eight loads of bees to place, evaluate, feed, pollen sub, and prepare for measured strength inspection. I love this work. I also help with the queen work in April, which I savor.

In the Fall, I'm tasked with 'the rent'; an opportunity to once a year, visit location owners to deliver the rent honey, a goody bag; and most importantly – a visit. Some of these families I have known for over 50 years. Locations are precious; as are our relationships with our landowners.

Am we ready for retirement? The WSJ piece addresses the sometimes jarring change when a long-time employee receives his watch and a sendoff – and then confronts the couch, a six-pack of beer before noon and [I'm being dramatic] a vegetative state. Spouses who have long kept a home, a career, raised children and their own network of friends and family find the newly retired spouse under foot and in the way.

This is the time of renewal.

In my little town, Gackle, North Dakota – a group of dedicated volunteers work to improve the community. A project to improve a local park includes a warming hut, a hockey rink, replace the pickle ball court. In little towns, project funds and donations are scarce. The Park Board lacks a non-profit status with the IRS and ND Secretary of State. I've never registered a non-profit. But I did. It took time I used to spend running a business. It is renewing. We can now accept corporate donations. Corporations require a W-9 to confirm the charitable donation.

Now, the Gackle Community Boosters can accept corporate donations. Now our little community can fundraise.

My friend Mark ported from a career in tourism to a volunteer position with the North Dakota Legislature. After a couple of years, he finds himself as Clerk of the Senate – a job he really enjoys. We often ride bike on a superb trail system in Bismarck/Mandan. We used to run marathons – but we now ride bikes. I want to Page for the Clerk of the Senate in 2023.

I used to fret over presentations and talks. I joined Toastmasters International, accepted the challenge to finish the Able Toastmaster program requirements. Toastmasters is kind of a relic in 2021. But I promise you the discomfort, the anxiety when speaking to the local Lions Club, Rotary, CA State Beekeepers, Tedx Talks will evaporate – because a renewal occurred.

The public views Beekeepers as a throwback curiosity. We are. With training, we can articulate our role as gatekeepers of the food supply. It's a cool thing when the audience is leaning forward in their chairs, locked on your remarks.

My other friend Mark is a retired dentist. Twice a year he flies into central America with a couple of other dentists. For three or four days, they set up a dental clinic, sometimes beneath a shade tree – and provide dental care for a long line of folks who have no dental care. None.

He returns exhausted and renewed. The focus of his effort dovetails with a resource he had little of earlier in his career – time.

I have no desire to go to Chili to teach beekeeping. I know nothing of how bees are kept in South America. But I have time now to go, and see Ag through a different lens. Instead of talking, I'll listen. The old chestnut, first seek understanding before seeking to be understood is a challenge for me. I can do it. I might learn – a lot.

The Mandarin Trees are in full bloom in late April in Newcastle. I planted trees in 2000; when I didn't have time to properly care for the trees. Now – I can. And really enjoy husbanding trees – and for a few more years – from time to time – the bees. BC

EST·1869 ROOT PUBLICATIONS

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BEEing Diverse: Inspiring Leaders in Beekeeping

Mark Your Calendars for October 1-3, 2021

The Return Of Bee Culture's Annual Event

We have an impressive lineup of speakers. The meeting will be held in our Bee Culture Conference Room. Watch these pages and our web page for more details as we firm up the details. We plan to start registration on June 1.

Susan Cobey runs Honey Bee Insemination Service and holds a 50% appointment with Washington 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. To diversity the U.S. gene pool, his includes the collection and incorporation of honey bee germplasm from their native European range. She provides training, instructional material and information in presentations, publications for both scientific and public audiences, worldwide to promote honey bee stock improvement. Her experience includes management of Honey Bee Research Laboratories at the Ohio University State and the University of California, Davis.

Dr. Tracy Farone is a Professor of Biology at Grove City College in Pennsylvania. She has worked in various areas of private practice, academia, and research for over 21 years. Since late 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, Dr. Farone worked in the field with dozens of back yard, 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. She traveled to Montana/Crow Reservation to work with 10K hive, migratory, commercial beekeeping operations. These experiences provided Dr. Farone with a unique perspective in the development of relationships between veterinarians and beekeepers. Dr. Farone has given and continues to give bee lectures at multiple universities, veterinary associations, and various bee clubs around the country. She has published several articles on bee medicine, including a monthly "Bee Vet" series for Bee Culture and BEEkeeping: Your First Three Years, written biosecurity industry guidelines for veterinarians entering beeyards, and developed an educational website, https://www.gccbeeproject.com/ . Dr. Farone's work has also been featured in the JAVMA.

Tammy Horn Potter helped her grandfather with his beehives beginning in 1997. In 2006-2010, she worked winter seasons with Big Island Queens in Hawaii. In 2008, she started Coal Country Beeworks, working with surface mine companies to establish pollinator habitat and apiaries in Eastern Kentucky. In 2014, she became the KY State Apiarist, helping create the KY Department of Agriculture Pollinator Protection Plan, the KY Certified Honey Producers program, and the KY Queen Bee Breeders Association. From 2015-2020, she has coordinated the USDA Honey Bee Health Survey in Kentucky. She also serves on the boards of Eastern Apiculture Society, Project Apis M, Honey Bee Health Coalition, and Green Forests Work. She is the author of the following books: *Bees in America: How the Honey Bee Shaped a Nation* (2005); *Beeconomy: What Women and Bees teach us about Local Trade and Global Markets* (2012); *Flower Power: Establishing Pollinator Habitat* (2019); and *Work I Knew I Must: Reminiscence of Forty-one Years of Factory Life* (Root, 2021).

Dr. Kim Skyrm is the current President of the Apiary Inspectors of America (AIA) and the Chief Apiary Inspector for the Massachusetts Department of Agricultural Resources (MDAR). Prior to these appointments, Dr. Skyrm received a Ph.D from Oregon State University focused on the environmental impacts affecting bumble bees native to the Willamette Valley of Western Oregon, was a Research and Development Scientist for Koppert Biological Systems, Inc. specializing in commercial bumble bee rearing and a Post-Doctoral Researcher at the University of Massachusetts-Amherst evaluating bumble bee colonies in the cranberry agroecosystem. Dr. Skyrm is an alumni of Georgia Southern University (Bachelors in Science, Biology) and the University of Nebraska-Lincoln (Masters in Science, Entomology with Education minor). In addition to being a bombiculturist (i.e. bumble bee rearing), Kim is also a hobby honey beekeeper. Dr. Skyrm has always been driven by an intense love of bees to serve in supporting roles informed by the latest scientific research. This is evident since Kim has been working with native and managed bees, beekeepers, farmers, and pesticide applicators for the past 14 years through outreach education, research, and extension. Dr. Skyrm has a "bees-eye view" of the world and is truly passionate about continuing to do work that preserves the viability and sustainability of bee populations!

Culture
merican Beekeeping

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 from Ohio Nursery inspectors and businesses. Barb monitors the County Apiary Inspection Program and addresses honey bee issues in the state. Barb has kept her own colonies of honey bees for over 35 years and belongs to several beekeeping clubs as well as The Ohio Lepidopterists and other insect related organizations.

Maggie Lamothe Boudreau is the sole owner of "Rayons de Miel" a 350 hive farm that produces 4000 queen/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. Maggie's farm is directly contributing to her research project by producing queens during the previous fall with the aim inserting them in a "queenbank" until the following spring so that they can be used very early in the season. These wintered queens would save a considerable amount of hives from which the queen died, or to produce nucs sufficiently early they could contribute to the pollination effort of crops. She also as many volunteer involvements with official beekeeping organizations such as the Quebec Beekeepers Association AADQ (1st Vice-President), the Quebec and Eastern Quebec Beekeepers Committee (administrator) and the national organization the Canadian Honey Council (3rd Vice-President) just to name a few.

Joan Gunter was raised in rural ND on the family farm. She attended college and earned a degree in education and business. After graduating, she taught school on all levels for 10 years while raising two boys with her husband Dwight. Joan and Dwight of Towner, ND, have been commercial migratory beekeepers for over 30 years traveling to MS, TX and CA. The family-owned company is primarily engaged in honey production, queen rearing, pollination and the sale of bees. Joan currently serves 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.

Other Speakers We'll Introduce You To Next Month Include –

Jackie Park Burris was born into the Park Beekeeping Family of Northern California and is owner of Jackie Park Burris Queens

Anne Marie Fauvel, University of MD (Bee Informed Partnership)

Julianne Grose, Brigham Young University. Associate Professor. Microbiology and Molecular Biology

Geraldine (Jeri) Wright is an insect neuroethologist in the United Kingdom. In 2018 she became the Professor of Comparative Physiology/Organismal Biology at the University of Oxford and Tutorial Fellow of Hertford College.

We are optimistically going forward with our planning of this event, due in part, to the apparent rapid advances in the public health situation. We will continue to monitor the situation and make rational/safe decisions going forward. The way it stands at this time, we will most likely limit attendance based on recommendations as we go forward.

We hope to see you in October!

Be sure and visit www.BeeCulture.com

BEE VET

"Sylvatic"

Dr. Tracy **Farone**

In honor of pollinator month this June, I have decided to highlight the sylvatic side of bee medicine: Our wild bees. "Sylvatic" is a word used to describe wild animal populations and is often used in the description of disease lifecycles in wildlife populations. For example, the "sylvatic cycle" of Rabies viruses is important to understand in the prevention of the disease in domestic animal species and humans. While much of veterinary medicine is focused on the treatment of domestic animal species, veterinarians may also receive training in wildlife medicine. I had the privilege of working at a wildlife center, while I was a veterinary student at Ohio State. It was yet another experience that taught me to consider the bigger picture of how all health is connected, the environment, domestic animal species, wild animal species, and humans. To help examine this One-health relationship, as it relates to bees, I decided to do something we often do in science and medicine: consult. So, I recruited the help of a wild bee health specialist, Dr. Margarita María López-Uribe, Assistant Professor of Entomology at Penn State University to address some of the key concepts that we should keep in mind regarding our wild bee pollinators. Much of her work has focused on squash bees, bumble bees, and relationships between genetic diversity and the environment. She also assists honey bee beekeepers overcome some of the challenges they face with their operations. Over Easter Break, we sat down (over ZOOM) and discussed the sylvatic side of bee medicine. Below are some highlights from questions I posed to Dr. López-Uribe during our discussion.

1. How many species of native pollinators in the U.S. are considered threatened/endangered?

According to Dr. López-Uribe, there are approximately 3,600 species of bees in North America. However, Dr. López-Uribe points out that, "The question of how many species are in trouble is still very much in development." Dr. López-Uribe considers the Xerces Society to be a great resource for information on native pollinators and notes that they list 20 bee species, mostly from Hawaii, as species with populations at risk. Only one species in the continental U.S., the Rusty Patch Bumble Bee, is officially listed as endangered. Dr. López-Uribe does believe that evidence is pointing to "a drop in species richness" associated with "the homogenization of the landscape and then the domination of a handful of species that adapt well to human-modified landscapes." However, she points out that more monitoring research is needed in this area, so we can have the data to fully understand what we may be losing in the first place.

2. Are some native pollinators managed to increase pollination of crops?

According to Dr. López-Uribe, in the U.S. only a couple of truly native, wild bee are "managed" as pollinators, including the Blue Orchard Bee and the Alkali Bee, primarily on the West Coast. Other "managed" bee pollinators, the Japanese Orchard Bee and Alfalfa Leaf-cutter Bees are wild but not native. Our discussion then included an interesting tangent on the definition of the word "native" as it is currently used with "native pollinators". Dr. López-Uribe prefers the use of "wild" bees/pollinators, as "native" may be more and more difficult to define. For example, "squash bees" originally came from areas of Mexico and the southwest U.S. to what is now the northeastern U.S., a thousand years ago as pumpkins and squashes were cultivated in northen latitudes of North America. So, what does "native" really mean? When is the timeline in the sand drawn? I will be using "wild" instead of "native" for the rest of this article.

To further clarify terminology, certainly honey bees can go "feral", but honey bees are best managed as domesticated, agricultural animals and are not considered "wild" (or native to the Western Hemisphere). During the discussion, we also discovered that we both use cats as an analogy to honey bees, in that cats are a domestic species, who can also live ferally, but like honey bees, this situation is not best for the health of the animal, native wildlife, or the environment.

3. How does your work promote the health of wild pollinators?

In addition to providing education about "real problems with pollinators" through many lectures and writings, Dr. López-Uribe's lab is currently investigating the medical ecology of pollinators and the possibility of "any spillover of pathogens" between bee species. There certainly is interest to see if honey bees and wild bee populations can transmit disease back and forth and/or act as reservoirs for pathogens. At this point, Dr. López-Uribe says, "While

Bee shown is of the Melissodes genus, " Long-horned" bee. Photo credit – Katy Evans

pathogens are everywhere . . . There is no good evidence yet that honey bees' pathogens are doing anything terribly bad to solitary bees – like the squash bee. Bumble bees are the exception. We know that bumble bees share a lot of pathogens with honey bees, and that bumble bees can get sick when infected with honey bee pathogens" One interesting finding from recent papers from Scott McArt and her lab suggest that more flowers in a landscape can actually dilute pathogens. Dr. López-Uribe states that "increased floral diversity and abundance may cause a dilution of pathogens on flowers, which will lower the pathogen pressure on all species." This research points to the environment as a plausible solution for decreasing disease threats for both wild bees and honey bees.

4. What health concerns do you have for wild pollinators? Infectious diseases? Parasites? Pesticides? Nutrition?

Dr. López-Uribe considers nutrition to be "likely the single most limiting factor" for wild bee health. She also believes this is the potential "point of conflict" between conservationists and honey bee keepers, as competition for floral resources between honey bees and wild pollinators can be a difficult fight for wild pollinators to win. The small colony size of social native bee species or the solitary lifestyle of wild bees may make it difficult to compete in areas saturated with honey bee colonies boosting tens of thousands of foragers. Honey bees also have beekeepers that can feed them when natural forage runs low. Dr. López-Uribe points out "wild bees don't have beekeepers to feed them." Limiting honey bee colony numbers per area can help level the playing field for wild bees. Dr. López-Uribe also states that loss of habitat has played a large role in nutritional challenges for all bees.

While both honey bees and wild bees are exposed to pesticides, Dr. López-Uribe considered two things that may make wild bees more sensitive to pesticides compared to honey bees. She explained, "Wild bees have solitary lifestyles – feeding of brood is much more direct – leading to potential increased pesticide exposure of larvae. (Secondly), many wild bees nest in the ground . . . and studies have shown that pesticide exposure through soil can be very high."

Regarding diseases, there is some good news but also much more to learn. The good news: *Varroa* does not involve wild bees, however, some viruses like Deformed Wing Virus, (DWV), has been found in several wild pollinators including bumble bees, solitary bees, and flies. *Nosema, Crithidia, Apicystis,* and *Spiroplasma* are among the other "pathogens" identified in wild bees, but according to Dr. López-Uribe, the real question is: "Are wild bees actual hosts?" These potential honey bee pathogens **have not** been shown to cause severe disease in solitary wild bees even though they can replicate in some species. Dr. López-Uribe emphasized the need for more disease research to provide solid evidence of the fitness costs of honey bee pathogens on wild solitary bees.

5. Honey bees get lots of credit for crop pollination. How important are wild pollinators to pollination of our crops?

Backed by plenty of strong science, Dr. López-Uribe emphasized "If you want to maximize crop pollination in large agricultural systems, you need wild bees ***and*** managed bees like honey bees." Here is where wild bees and honey bees can really work together. Honey bees are largely effective due to the large numbers of foragers working the land and our ability to place them anywhere (for example, in the middle of a farm). Overall, wild bees are often more effective pollinators on a per visit basis. Think of a big, super fuzzy bumble bee working a flower, compared to the sleek honey bee! Dr. López-Uribe explained that these different behavioral approaches to working flowers demonstrate how domesticated and wild species can have very complementary relationships, especially in large acreage of monoculture where wild bees may only benefit crop flowers at the edge of fields. Diversity of plantings and larger portions of natural habitat within farms can be used to attract more wild pollinators to supplement honey bee pollination.

Peponapis is a genus of solidary bees. Photo credit: Dr. Lopez-Uribe

6. What would you like honey bee beekeepers to understand to promote wild bee health?

Dr. López-Uribe emphasized two main points for honey bee beekeepers or potential honey bee beekeepers that she believes are critical to understand. First, "honey bees are an outlier to the biology, behavior – everything compared to other

A Carpenter Bee. Photo credit Katy Evans

A sweat bee.
Photo credit
Kathy Demchak

bees, and they often compete for the same floral resources." Secondly, she accentuated, "We do need to understand that honey bees are domesticated animals that need food, care, treatments. This takes training, equipment and understanding." She believes the challenge is to get past the "save the bees, romantic idea and that buying a (honey) bee colony is helping – when in fact you may not be helping anyone – by introducing honey bee hives to an area and not taking good care of the colony you may actually be just trashing the environment and spreading pathogens." Her advice to new beekeepers is to be sure you are being "a good steward of the environment" by being sure you have enough knowledge and forage/flowers/habitat for your colony before considering getting one. Ultimately, better understanding the balance of relationships between our domesticated species and wild species with our environment will lead to the best health of all pollinators. BC

Helpful Links to Pollinator Seminars:

Pollinator Health Challenges: A bee's perspective (Margarita López-Uribe) – Several bee populations are in decline around the globe. Like for many other animals and plants, the drivers of bee declines include habitat destruction, exposure to pesticides, increased pathogen burden, and climate change. This seminar will explain in detail how these stressors impact bee health throughout each step of the bee's life cycle.

Bee Biodiversity in Pennsylvania (Margarita López-Uribe) – Pennsylvania is home to over 430 species of bees but who are they? How are they different from each other? Are all species native to North America? How can you help conserve bees? You will find answers to all these questions in this seminar.

Mason bee management for backyard and orchard pollination (Natalie Boyle) – Mason beekeeping is a fun and easy way to harness the pollination power of solitary bees for agricultural producers and backyard gardeners alike. This seminar will introduce you to the mason bee life cycle, and provide instruction on where, when, and how to manage them sustainably and responsibly.

Bumble bee biology and management for pollination (Erin Treanore) – Bumble bees are well-known for their fuzzy appearance and charismatic buzzing as they fly from flower to flower, but did you know these characteristics are part of the reason they're such great pollinators? Gardeners, farmers, and bee-enthusiasts alike will benefit from learning more about the bumble bee life cycle and why they're so important to our ecosystems. This seminar will also provide recommendations for landscape management to support these pollinators and discuss the commercial bumble bee industry.

Information on the Alkali Bee **https://www.fs.fed.us/wildflowers/pollinators/pollinator-of-the-month/alkali_bee.shtml**

Apiary Inspection South Carolina

Stephen **Cavin**

The Apiary Inspection Program in South Carolina is housed in the Department of Plant Industry (DPI) in Regulatory Services at Clemson University. In January of 2020 a fulltime apiary inspection program started. While DPI has always inspected apiary operations throughout South Carolina, the inspectors involved in the apiary program were also involved in other aspects of DPI. Currently, there is one fulltime employee and three DPI inspectors working in the apiary program.

In South Carolina, beekeepers are not required to register as beekeepers, register honey colonies or register apiary locations. Honey bee Import and Exports Permits are required by beekeepers moving honey bees in and out of South Carolina. These permits include colonies, nucs, packages and queens.

Additional services include colony inspection and testing for foulbrood diseases and Africanized Honey bees. Samples collected by inspectors are sent to the Molecular Plant and Pest Detection (MPPD) Lab. The MPPD Lab is housed in the Plant and Pest Diagnostic Clinic in Regulatory Services. The MPPD Lab utilizes molecular techniques to identify pathogens. Pathogens are identified by polymerase chain reaction (PCR) and by real-time PCR. DNA is extracted from symptomatic tissue and prepared for PCR. The PCR process allows us to amplify a trace amount of pathogen DNA into a larger and detectable amount of DNA. This technique identifies pathogens much faster than traditional techniques and identifies pathogens that are difficult to isolate and culture. The purpose of the lab is to support South Carolina Beekeepers in the early detection of bee issues. Test results are usually received, and beekeepers notified within five business days of sample collection.

Since 2011, South Carolina has participated in the USDA National Honey bee Survey. One set of samples collected are screened for *Tropilaelaps*, *Apis cerana* and *Varroa* Mite loads by visual and microscopic analysis. A second set of live bees are collected and sent to the USDA lab in Maryland where molecular and visual analyses are conducted on multiple viruses. Additionally, samples of bee bread are collected and sent to the USDA Agricultural Marketing Service (AMS) in Gastonia, NC. The AMS lab test screens the bee bread for 199 known pesticides. These surveys have provided beekeepers a comprehensive management strategy for honey bee pests and health.

In May of 2020, the Asian Giant Hornet (AGH) received a lot of press coverage even in South Carolina. The calls and emails from the public were too many to count, I'm happy to report that all reports were negative for AGH. Most of the reports were for Eastern Cicada Killer, Yellowjackets, European Hornets and Bald-faced Hornets. South Carolina participated in a planned Invasive Pests of Honey bees Survey led by the Pennsylvania Department of Agriculture. South Carolina had traps set in high-risk areas of the state to monitor for AGH. The traps were monitored every two weeks for three and half months. No Asian Giant Hornets were found in South Carolina.

The Apiary Inspection Program in South Carolina works together with beekeepers in a partnership to protect honey bees. We rely on the beekeeping industry to contact the program and work hard to engage our stakeholders through various outreach programs. BC

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CLEMSON UNIVERSITY
HONEY BEE INSPECTION PROGRAM
A partnership to protect your honey bees

Almonds & Bees

It's A Partnership!

Josette **Lewis**

Almonds and bees are truly a partnership designed by nature. Almonds evolved over millennia to require cross-pollination, and the almond blossom is designed to draw the bee inside. In turn, almonds reward bees with nectar early in the year when few plants are flowering in the landscape and almond pollen provides high quality nutrition for bees. In almond farming, the same is true: farmers do well when they have a trusted relationship with good beekeepers.

Today, almond farmers spend an average of more than $400 per acre on pollination, accounting for 15-20% of their annual cost of production, on par with irrigation and harvesting costs. Safeguarding that investment in honey bees is in the interest of every grower and a high priority of the almond industry. When I joined the Almond Board of California just over two years ago, little did I know how much I would learn about honey bees, and now native bees, and how much I would work with the beekeeping community. What a fantastic addition to my job. Who knew I would be a regular reader of *Bee Culture* and subscribe to two beekeeping and pollination podcasts to deepen my understanding of the world of bees while driving miles up and down California's almond growing region.

Honey bees spend an average of six to eight weeks each spring in our almond orchards. Our most important priority is to make sure they can do their job safely and effectively. The Almond Board began funding research on bee health and pollination in 1995. That science – together with practical input from farmers, beekeepers, and state and federal agencies underpin the *Honey Bee Best Management Practices* guide – the most comprehensive crop guide for advancing bee health. We have not shied away from research that showed that we need to change some of our practices. And evidence shows that is happening, with dormant pesticide use down almost 70 percent, for example. To ensure the Honey Bee BMPs become standard practice, we conduct training every year for farmers and other industry professionals. We fund the Bee Informed Partnership to research trends in bee health (hope you filled out this year's BIP survey), but we also contact their field tech transfer teams to investigate any concerns we hear from beekeepers about potential exposure of their hives. Fortunately, these are rare occurrences.

In the last two years, our commitment has expanded to add forage to orchards on top of almond blossoms. If the Fall rains cooperate, a cover crop or hedgerow can tide bees over with flowers if they arrive in our orchards early or provide food if they stay past bloom. In all cases, it provides added diversity to the bees' diets. Research at UC Davis shows that hives coming out of almond orchards with cover crops are healthier. Working with Pollinator Partnership, almost 55,000 acres of almond farms have been certified as Bee Friendly Farms. We also launched the Bee+ Scholarship, an incentive for growers to access free cover crop seed from Project *Apis m.* or to cover the cost of registration as a Bee Friendly Farm. Project *Apis m.*'s Seeds for Bees now provide 7,000 acres of pollinator cover crops in almond orchards. Incentives aim to get growers to give these pollinator forage practices a try without bearing all the cost and risk. It creates momentum. Farmers learn by looking over at what their neighbor is doing.

As we look at how to create a healthy environment for all pollinators, honey bees and native pollinators alike, it is clear that we have to look to our working lands as part of the solution. It is because of our natural partnership with bees that we were instrumental in launching the California Pollinator Coalition in April of this year. With more than twenty founding members, representing most of the farming and ranching acreage in the state, together with conservation organizations, and of course our California State Beekeeping Association, we are united in the goal of expanding habitat for pollinators.

The Almond Board is funded by almond growers, and all our activities are approved by committees of industry members. All the activities I have talked about here are not only a great part of my job, but more importantly, are an indication of almond growers' commitment to the partnership with bees and beekeepers. The Mission of the Almond Board is to "Make the world better by what we grow and how we grow." While bees visit our orchards for less than two months of the year, research shows that they leave stronger than when they arrived. Evidence that we are off to a good start on achieving our mission. BC

Pollinator Week

Matt **Mulica**

By now we're all familiar with the sobering statistics of population declines among honey bees. From 2013-2020, annual managed bee losses were high, between 35-40 percent nationally according to the Bee Informed Partnership. With about a third of our food in the United States being supported by pollination from bees, it will require an all-hands-on-deck approach to revive bee populations and reverse these negative pollinator health trends.

One key to reversing bee health decline is establishing pollinator forage and habitat. This is central to the mission of the Honey Bee Health Coalition, which brings together beekeepers, growers, researchers, government agencies, agribusinesses, conservation groups, manufacturers, and consumer brands to improve the health of honey bees. And while a majority of our work is focused directly on helping beekeepers and farmers implement practices, the coalition promotes collaborative strategies that develop high-quality, bee-friendly environments in all places – from rural farmland to densely populated urban landscapes to sprawling suburban areas. Everyone has a role to play in reviving honey bee health.

"People in urban areas can put habitat down in grass ways, backyards, flower beds, and urban settings like parks. There's just tremendous opportunities for places for habitat. We like to engage in that conversation both with the farmers and with the non-farmers," says Wayne Fredericks, a corn and soybean farmer from Osage, Iowa who serves on the board of the American Soybean Association.

There are simple things you can do to avoid harming bees on your property. These include following the label on all landscaping products, paying special attention to application rates and ensuring you are using the right amount of any product for the area you are treating; letting flowers grow, even those considered weeds like dandelions, as they are often the first springtime forage for bees; providing adequate ground cover for pollinators to use during the Winter; and leaving certain areas of your property, like behind sheds, more natural by not mowing.

Beyond doing no harm, you can also enhance your property with pollinator plantings which look great and provide a varied and nutritious diet. The first approach to accomplish that goal for most people living in suburban areas is planting a pollinator garden. Creating a pollinator garden is simple but there are steps that need to be followed to ensure it not only effectively supports pollinators but also incorporates sensible conservation practices. According to the Million Pollinator Garden Challenge, which is a nationwide call to action to create gardens for pollinators, a pollinator garden should:

- Use plants that provide nectar and pollen sources
- Provide a water source
- Be situated in sunny areas with wind breaks
- Create large "pollinator targets" of native or non-invasive plants
- Establish continuous bloom throughout the growing season
- Eliminate or minimize the impact of pesticides by following the label closely.

From roadside ditches to public parks to office rooftops, there are numerous projects and initiatives assisting the general public to help support bee health. The Focus on Forage Series (honeybeehealthcoalition.org/focus-on-forage) from the Honey Bee Health Coalition highlights some of the projects working on the ground and leading innovative efforts to create honey bee and pollinator forage. Some of those projects include:

HONEY BEE HEALTH COALITION

Million Pollinator Garden Challenge (**millionpollinatorgardens.org**) which we have already referenced, is an initiative from the American Seed Trade Association and other partners within the National Pollinator Garden Network that calls on Americans to preserve and create gardens and landscapes that help revive the health of bees, butterflies, birds, bats, and other pollinators.

Pollinator Partnership (**https://www.pollinator.org/learning-center/gardens**) is an organization dedicated to promoting the health of pollinators through conservation, education, and research. It has a wealth of information on how homeowners can improve bee health of their land.

Buzzing Gardens (**beesmatter.ca**), created by a Canadian-based organization called Bees Matter, provides Canadians with seed kits to support honey bee and pollinator forage across the country. The effort, which has been underway for several years, has provided residents with enough seed to plant 350,000 sq. ft (32,516 m2) of pollinator-friendly gardens.

Feed a Bee (**feedabee.com**) is an initiative from Bayer CropScience that plants forage in 50 states with over two billion wildflowers planted in the past two years.

The plight of the honey bee is reaching a critical point, the consequences of which are reverberating throughout the landscape and can have impacts to our food supply. But we can also be encouraged by the comprehensive and innovative efforts we are now seeing not only among the general public but from Federal and State agencies, municipalities and local government agencies to develop the habitat needed to support a pollinator population rebound. Together we can achieve a healthy honey bee population that supports productive agricultural systems and thriving ecosystems. Check out the resources we've detailed in this article to learn more. For more information about the Honey Bee Health Coalition, visit **honeybeehealthcoalition.org**. BC

Minding Your Bees And Cues

It's Getting Warmer. How Will The Bees Respond?

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

Remember the 80s? For those of you who have been keeping bees for 30 years or longer, or who can look back at generations of beekeepers in the family, you know that what's "normal" today is very different from "normal" a few decades ago. But we've adapted and kept at it, despite the worries about nutrition, mites, viruses, and pesticides. In fact, the number of beekeepers has probably increased in the last decade.

In May of 2021, the National Oceanic and Atmospheric Administration (NOAA) reset the data that climatologists use to predict weather and to describe what is "normal" at a given time of year. So they're getting rid of data from the 80s, and adding the 2010s to the 30 years of temps they use to tell us where we stand on a given day. Since the 20-teens was a very warm decade on average, what are considered seasonably "normal" temps will now be warmer, too.

Despite the sudden rain shower, these bearding bees are hanging onto each other outside their hive to help cool the interior temperature. Photo credit Becky Masterman

Change is a constant in beekeeping, but the updated climate data makes us think about how warming temps might impact the bees and beekeepers. What do we want the new normal to be a decade from now, in terms of climate and landscape? And what can we do to get there?

As Minnesota based beekeepers, we think we're experts on cold weather beekeeping. And no, the blizzard most likely didn't kill your bees. Honey bees are resilient when it comes to temperature extremes and are able to regulate and maintain colony temperatures in both cold and hot weather. They can generate heat by clustering and shivering their flight muscles, or cool the hive by spreading out and moving moisture through their home through fanning droplets of water with their wings.

If average temperatures rise, how could it impact your bees? Scientists have been asking this question through controlled experiments and decades-long observations. We are reporting some interesting findings that have been published in peer reviewed journals over the past several years. We only report a fraction of their results due to space; we encourage you, dear reader, to use the article references if you want more details.

Heat Wave

Researchers in France examined both colony and individual responses to heat waves that they simulated (Bordier et al. 2017). This study reported an increase in foragers returning with water to cool the hive. Good news for these bees was that the increase in water foraging did not come at the expense of nectar and pollen collection. While the researchers reported remarkable adaptability of honey bees to their simulated heat waves, they also warned that the colony response could make the bees less ready to handle other environmental stresses.

Studies by two Saudi Arabian scientists reported how indigenous and introduced subspecies of honey bees fared in desert and semi-arid conditions (Alattal and Alghamdi, 2015). Their results show significantly higher survival rates in the indigenous *Apis mellifera jemenitica* colonies versus the *A. m. ligustica* (Italian) and *A. m. carnica* (Carniolan) colonies. It is important to note that the researchers mentioned the significant impact of varroa and nosema on colony mortality in their study (i.e., mites are always trying to confound our picture of what else may be negatively impacting the bees).

The bees' solution to temperature extremes is going to be based on their genetic and behavioral abilities to adapt, not based on human-centric fixes. Don't install an HVAC system in your beehive or take them for a dip in the lake. While all honey bee subspecies in the U.S. are introduced, they have remarkable abilities to accommodate a wide range of temperature extremes and fluctuations. Some honey bee subspecies have great traits for managing cold Winters or hot Summers. Carniolan and Russian bees tend to pack honey down lower in the brood nest before Winter. They consume less honey over Winter and their Spring build up is temperature and resource sensitive. Italians do the opposite and tend to be better for warmer Winter locations.

Honey

Accessing individual beekeeper data in both Poland and the UK, researchers reported on some sweet trends, most notably an increase in honey production over 45 years at both sites (Langowska et al. 2017). The increased yields were attributed to warmer temperatures. In early season, the bees could build up faster, increasing their foraging force. Later in the season, researchers suggested that bees might be able to

take advantage of novel nectar flows available through prolonged warm weather in Fall.

Although climate changes might mean more floral resources in some locations, temperature extremes also have negative impacts on plants, many of which are less likely to thrive in warmer conditions. Read Matt Suwak's article to learn more about how these changes can impact your garden and other plantings (**https://gardenerspath.com/how-to/hacks/hardiness-zone-changes/**).

Concerns

Honey bee temperature response data support the resilience of honey bees to climate changes, which is not surprising considering how adaptable honey bees are to their conditions. Changing conditions should remind us that while it is important to propagate stocks of bees that thrive in your particular (and changing) climate, it is likely more important to consider the traits of disease and pest resistance and or tolerance in your bees.

One of the threats of climate change is that animals (like wild, native bees) may become extinct if they are not able to adapt to quickly-changing habitat conditions. We all agree on the need to put more flowers in the ground for pollinators, but some pollinators have life cycles dependent on a specific flower. If the flower and the bees are not in sync, the results could be disastrous for both. We are less concerned about the impact of climate change on honey bees, but more so on the crops and pollination networks, including the vulnerable wild bees that connect them. We think that taking actions to combat climate change is one of the most important ways we can support our vulnerable native pollinators and the ecosystems they sustain. BC

A peek into a Winter hive reveals tightly packed bees generating heat to warm their cluster (not their home). Photo credit Becky Masterman

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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 and Bridget confirm NOAA's claim that the 80s were cooler.

'Bee Man' – Norm Gary

Kathy **Keatley Garvey**

Urban Beekeeping

Pesticides, parasites, predators, and a multitude of microorganisms threaten the survival of honey bees, says retired apiculturist Norman Gary of the University of California, Davis, but so do hobby beekeepers in urban environments who are rearing too many colonies for bees to "survive and thrive."

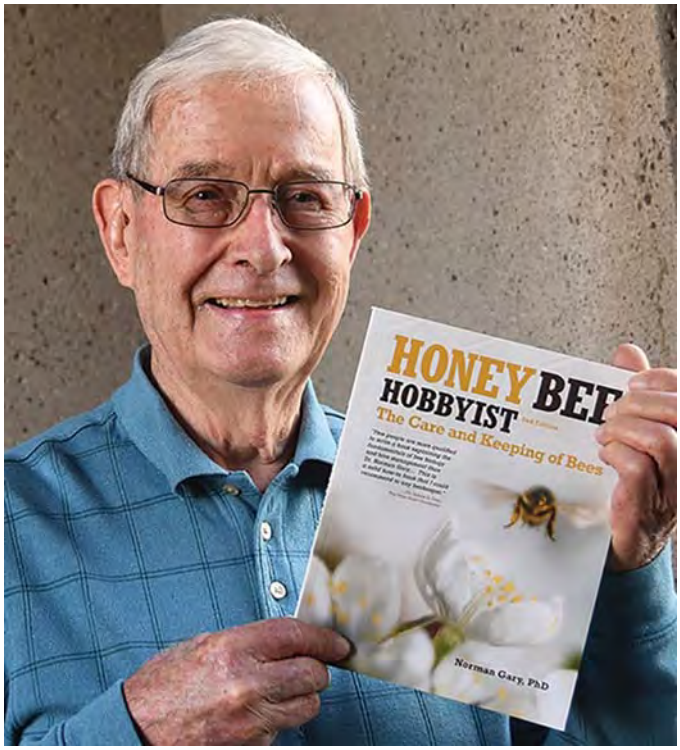
They should limit their hobby to two colonies, says Gary, 85, whose expertise in beekeeping, including professor, scientist, author and professional bee wrangler, spans seven decades.

"Increasing populations of bees can easily 'overgraze' the resources," Gary explains. "Excessive competition for limited nectar and pollen sources also threatens hundreds of native bee species, such as bumble bees, that have similar dietary requirements."

In his newly published second edition of his book, *Honey Bee Hobbyist: The Care and Keeping of Bees* (Fox Chapel Publishing, East Petersburg, Pa.), he includes a chapter on "Urban Entomology" that "treads on sacred beekeeping ground by proposing a radical change to beekeeping in urban environments."

But it's time "to recognize the realities of the urban environment and make appropriate changes in beekeeping practices," he declares.

Gary, a Sacramento-area resident known internationally as "The Bee Man" says that urban environments vary greatly, from the heart of New York City or San Francisco where small residential lots typically have limited vegetation to smaller urban areas that often have "open countryside within the foraging area of your bees."



Norm Gary with his newly published book, second edition.
Photo by Kathy Keatley Garvey.

"The yield of honey per colony is declining significantly in urban environments," he says. "These declines leave no doubt that overpopulation of bees in urban settings is the primary cause. Few beekeepers are aware that each bee colony consumes at least 100 pounds of honey annually, made from approximately 200 pounds of nectar! When nectar is abundant and there is good weather for foraging, a typical honey colony has the potential to produce more than 100 pounds of harvestable honey per year."

"This is far more than typical hobby beekeepers are harvesting these days," Gary relates. "It should be obvious that hobby beekeepers are keeping too many colonies in the typical urban environment."

"Hobby beekeepers typically start out with one or two hives, but that often leads to several more due to their enthusiasm for keeping bees and harvesting more honey and equating the number of hives with elevating their status as beekeepers."

In his book, he shares his beekeeping knowledge, dispels many beekeeping myths and provides science-based information. He covers such subjects as "To Beekeep or Not to Beekeep," "The Bees' Home," "Reproduction," "Colony Defense and Sting Prevention" and activities inside and outside the hive.

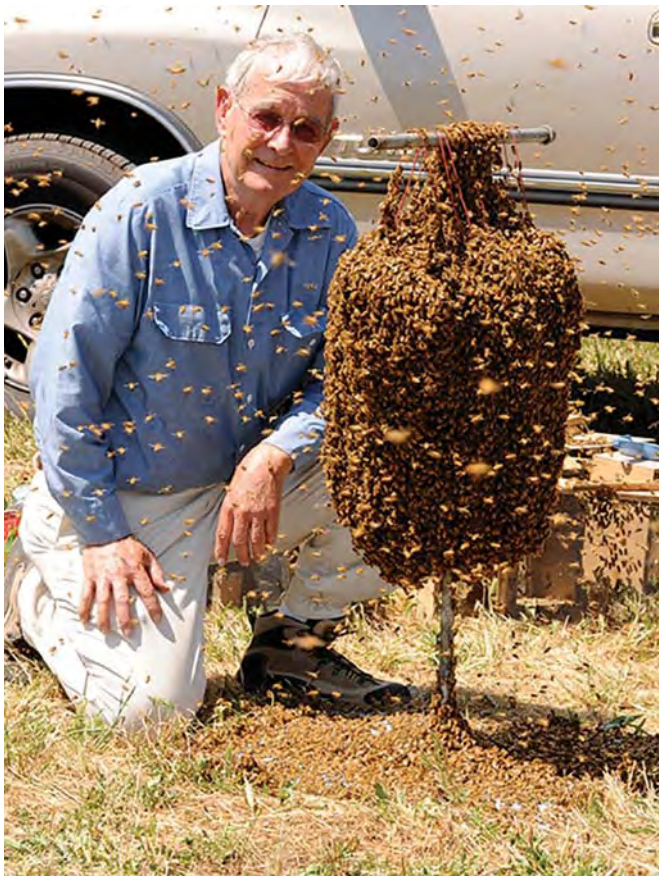
New additions include chapters on beekeeping clubs, entertaining with bees, and formal beekeeping education (including the UC Davis-based California Master Beekeeper Program, headed by Extension apiculturist Elina Lastro Niño).

Gary, who holds a doctorate in entomology from Cornell University, joined the UC Davis entomology faculty in 1962, retiring in 1994 after a 32-year academic career. He has authored more than 100 publications, including scientific papers, book chapters and popular articles in beekeeping trade journals.

A 70-year beekeeper – one of the longest in the nation – Gary began keeping bees at age 15 in Florida. His career includes hobby beekeeper, commercial beekeeper, deputy apiary inspector in New York, honey bee research scientist, entomology professor, author, bee wrangler and Guinness World record holder.

During his professional bee wrangler career spanning four decades, "The Bee Man" served as a consultant and bee stunt coordinator for 17 movies, 70 TV shows and six TV commercials. Among his credits: "Fried Green Tomatoes" and appearances with Johnny Carson and Jay Leno on Tonight Shows.

He launched the Thriller Bee Shows, performing more



Norm Gary gets ready for bee wrangling. Photo by Kathy Keatley Garvey

than 100 times in three western states, with venues that included the California State Fair. He drew widespread acclaim for wearing a head-to-toe suit of clustered bees while "Buzzin' with His Bee-Flat Clarinet."

Gary once trained bees to fly into his mouth to collect food from a small sponge saturated with artificial nectar. He holds the Guinness World record (109 bees inside his closed mouth for 10 seconds) for the stunt. He's also the person behind the "bee suit" record in the Guinness World Records; Gary clustered more than 87 pounds of bees on a friend.

Today, as a musician, he plays the clarinet, alto sax, tenor sax, and flute with several groups, and is updating his website, **http://www.normangary.com**.

No more "Buzzin' with His Bee-Flat Clarinet," though. BC

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UC Davis emeritus professor Norm Gary examines a frame at the Harry H. Laidlaw Jr. Honey Bee Research Facility, UC Davis. Photo by Kathy Keatley Garvey

BIGGER PICTURE

Jessica **Louque**

Feeding Your Bees. Think Ahead.

Last year, our community couldn't have our normal farmfest so we had a Sunflower Trail instead. By sheer luck, the sunflowers we planted here were right on time for the trail. This was mostly due to the fact that I had that skateboarding accident and broke my everything and we had to wait until I could move a little better to plant the seeds, but it worked out in the end. We planted what was roughly four acres of sunflowers that bloomed in the last two weeks of September and lasted a short while into October. There were around 11 hives in the immediate vicinity, plus three more at our ag barn about half a mile away. Out of all of our bees, these hives by far did the best in overwintering. There were no colony deaths in these, and most were double deeps by the first week of April. We lost a handful to a bear with two cubs while we were gone with the dogs one weekend, but it hasn't been back around since Pickle and Pumpkin have returned to guard the house. One of the hives it destroyed was only about 20 feet from our back door, and it looks like it might have hung out with the chickens and pigs for a little while. Those casualties aside, these particular hives look better than all our others, and I'm guessing it's from the food.

I am all for some sugar syrup feeding. As much as I hate it, I also believe feeding pollen patties is necessary for healthy colonies in dearths. Both of these will typically rely on artificial food sources though, and I just don't think they can compete with the real deal. Maybe I've never really paid attention, but as the first time I've had the space to grow so many flowers, it definitely made a difference. I won't be giving you a statistical analysis or anything, even though I normally lean towards a scientific observation, but it's enough to see how much more robust and – not dead – those hives are compared to bees that didn't have access to those flowers.

In North Carolina, we basically have magic eight-ball weather where you can shake it around and get just about as good of a prediction as watching the news. It's not that uncommon to have 70s and 20s in the same week. A couple days ago, it was 80 and then we had tornadoes and a hailstorm. It makes keeping bees alive over the Winter difficult. If you've been keeping up with the trends, you'll see that a lot of the bigger commercial guys have a lot of success overwintering their hives in cold storage, so that they get a brood break, the temperatures are consistent so the colony doesn't start producing earlier than they need to, and the daylight is controlled for queen laying. In normal weather, our Winter conditions vary wildly and can cause a lot of dead colonies trying to keep their brood warm in a cold snap. It can be hard to predict the true end of Fall in cases like these, and I think our sunflowers hit it just right. The brood will obviously be winding down as the days get shorter, and Winter is coming no matter what. Having an abundance of pollen at this time gives a huge boost of nutrition to your Winter bee babies and the nectar coming in will add to the Winter honey stores.

I did make a large batch of AP23 pollen patties that everybody received a couple times before Winter and then again in February and March. Once we had a couple of warmer days and I could see the bees flying, I knew there would be brood on the way. We have a lot of problems with colonies dying right next to food to keep brood warm, so feeding pollen patties before the spring blooms starts really keeps the bees healthier and gives them in-hive access that conserves their energy.

Now obviously, it's just not possible for everybody to go out and plant several acres of flowers for their bees. If you can't do this, try your best to find a good natural foraging area and supplement them as much as you can to keep them healthy. I normally use Honey B Healthy with my sugar syrup to give a little boost, but just plain sugar syrup is better than nothing. The important thing is to provide what your colony needs.

Always remember that something is better than nothing. Find a pollen mix that is something you like, and feed your bees what they can handle. Don't over feed them or you'll end up with too many hive beetles to deal with, but feed them enough to keep them busy for at least four to five days. If they don't eat it by then, it will be dry and gross anyway and they'll throw it out. Some people have access to different syrup mixes through companies like Dadant, and these are fine too. The important thing is to keep them fed. Nutrition for your bees is really only secondary to *Varroa* control, and could arguably be the most important part of keeping bees alive. I don't know why I didn't pay more attention to the timing, but I would definitely say that the late Fall food source contributed to the success of the hives.

If you do happen to have availability to plant for your bees, consider the timing of bloom. We were cutting it close to our frost date, but we were lucky. The sunflowers also provided ample pollen and nectar, but there may be other flowers that you prefer that could also provide for your bees. This year we will try to plant eight acres of sunflowers, and try to start it with buckwheat before we plant the sunflowers to give a nitrogen boost from the dying buckwheat stalks.

As I mentioned in a previous article, I think Winter blooming plants may also be incredibly helpful to bees, but I haven't seen this in action. I am hoping this year to be able to start planting with this in mind, particularly with camellias. Everybody has a different situation where they keep their bees, and some of you guys probably live in an area that the additional feeding might not even be necessary. If your primary goal is using your bees for pollination, it might be a good boost to have larger colonies in the Spring. If you have bees for honey, you probably don't want to sugar feed too much unless it's after your honey harvest to make sure you're not selling sugar water honey to people. Ideally, you would want minimal input to the bees from the beekeeper side so they are more self-maintaining and less expensive, but in reality, beekeeping is too expensive to gamble on whether your bees can take care of their nutritional needs based on the most convenient place you have to put their hive. As almost every aspect of beekeeping involves human manipulation and intervention, it's not a bad idea to err on the side of success.

Do your research on additives, sucrose solutions, and different types of pollen patties. Compare your options to what you can afford, both in money and in time. It's no small ordeal to make pollen patties and to clean up the mess it makes (maybe that's just me?). You could also order actual pollen baskets to make patties, or use extra of your own hives to collect pollen and feed back to your bees in the wintertime. It's up to you if it's worth the cost of a smaller hive to produce your own, or to buy someone else's pollen from a different area of the country. There's also the possibility that there could be various chemicals in pollen baskets produced in a separate place, but it's something you can also talk to the producer about if you're concerned.

There are plenty of resources available to educate yourself on the benefits of adequate nutrition for your colonies, but the most important thing is to do what you can within your means. If you suddenly decide that you need to feed your bees every other day, eventually you're going to get tired of the bar you've set for yourself. Try to find something reasonable that you can handle with the time you have, and the cost compared to what you're willing to spend on your bees. Buying pre-made AP23 patties will probably be more consistent than what you can make at home, but it will cost you around $5 per patty, plus shipping. A five-pound bag of dry mix will cost you

about $24 for you to make it yourself, or a 40-pound bag for around $90. Global Patties sells for around $1.77/pound and has rave reviews. You can get a 10-pound box of pre-made Ultra Bee patties for $37, or a 10 pound box of Mega Bee pollen patties for $35. Most pollen patties will have people who swear by them in a cult following, but no patty will work during a pollen flow, so if you put it in at the wrong time, don't expect success. Again, take the time to do some research, sift through some forums, and take the advice of beekeepers in your local area. If you take your bees' nutrition seriously, I think you'll have a great return on your investment in the next Spring. BC

Jessica Louque raises bees, children, dogs, birds and lots of other things and grows sunflowers, with her husband Bobby in North Carolina.

POLLINATOR WEEK – 2021

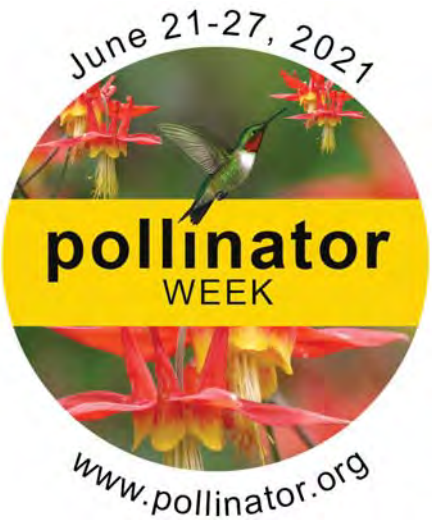
Kelly **Rourke**

2006 was a big year for pollinators. This was the year the National Academy of Sciences, National Research Council conducted a study on the "Status of Pollinators in North America." This study garnered so much attention they ultimately published it as a stand-alone book in early 2007. 2006 was also the year when the first inklings of Colony Collapse Disorder began circulating, causing anxiety for the stability of our food supply. With much cause for concern Pollinator Partnership took the lead on establishing a designated time to raise awareness, take action, and celebrate these essential species. It was an idea that Dr. Larry Stritch, former Forest Service National Botanist, and Pollinator Partnership's President and CEO, Laurie Davies Adams, incepted. The team initially secured a resolution from the Senate and then a proclamation from the Secretary of Agriculture, and in 2007 National Pollinator Week was born.

Pollinator Week is about raising awareness about the importance of pollinators and celebrating these animals that provide critical ecosystem services. Pollinator Week encourages people to engage in local and national efforts during the third week of June, this year June 21-27th, to learn and educate others. During this time, Pollinator Partnership aims to promote several critical messages that will help promote pollinators: 1) Plant for pollinators and provide nesting sites. 2) Reduce or eliminate the use of harmful chemicals. 3) Support local farmers and beekeepers that practice sustainability. 4) Conserve resources to reduce your carbon footprint, as pollinators are also negatively affected by climate change. 5) Lastly, support organizations and advocacy groups that are working to protect all pollinators.

Each year, Pollinator Partnership requests proclamations from the Governors of all 50 states as well as from the Secretary of Agriculture and the Secretary of the Interior. We also request for landmarks to display their colored lights in honor of Pollinator Week. In the past we have had the Empire State Building, Niagara Falls, and the CN tower in Toronto light up in celebration of Pollinators, as the celebration has grown internationally. At the local level, Pollinator Partnership provides a platform for groups and individuals to share their own activities on our website so that nearby community members can join in on the celebration. Each year we have over 200 events registered on our map, many being virtual this year due to the Covid-19 pandemic. Activities have ranged from planting days and plant sales, parties with pollinated foods and drinks, nature walks, and beekeeping or pollinator identification classes. In a time of uncertainty, it is wonderful to see people gather, virtually and safely outdoors, to celebrate pollinators.

You've probably heard the phrase "one in three bites of food we eat is a result of animal pollination." This year Pollinator Partnership's annual Poster, "Pollinators



and Agriculture: A partnership on the land", portrays exactly that, how pollinators support healthy food systems and ecosystems and how promoting biodiversity in agricultural settings can be beneficial. Also represented on the poster are the many, diverse sponsors that support pollinator conservation. Here at Pollinator Partnership, we value diverse perspectives and believe that bringing everyone to the table will create the biggest impact for pollinator conservation.

Promoting healthy pollinators in agricultural settings has a direct impact on the quality and quantity of our crops, while simultaneously benefiting the health of humans, plants, and the planet. Actions for pollinators on farms, like the planting of habitat including buffers, pollinator gardens, hedgerows, and cover crops, improves the health of our air, water, and soil, positively impacting farming operations. Pollinators and their habitat can economically benefit farmers through increased yield, decreased maintenance, and less reliance on chemical inputs. Pollinators in-turn rely on croplands and adjacent natural areas for forage, nesting, and refuge. This poster is an artistic depiction of the harmony that can be achieved when agricultural landscapes embrace pollinator-friendly management practices. Such Best Management Practices focus on maintaining healthy populations of both managed honey bees and wild pollinators in farm settings. Best Management Practices include:

- Minimizing the use of pesticides to reduce the impact on pollinators or spraying at night when bees are less active.
- Providing different blooming plants throughout the growing season, especially in early spring and late autumn.
- Minimizing tillage to protect ground nesting pollinators.
- Creating designated permanently untilled areas and leaving woody or pithy stems for native bee nesting.
- Ensuring clean water sources are scattered throughout the landscape.
- Choosing a variety of native plants to act as windbreaks, riparian buffers, and field borders throughout the farm.
- Planting unused land with temporary cover crops that can provide forage.

The many ways to help pollinators, as outlined in this article, align directly with Pollinator Partnership's mission to promote the health of pollinators, critical to food and ecosystems, through conservation, education, and research. We are constantly striving to convey the importance of pollinators in our daily lives. Visit **www.pollinator.org** to learn, take action, and donate in the name of the health of pollinators, people, and the planet. Happy Pollinator Week!

DRONE CONGREGATION AREAS

Theresa **Martin**

Dones in DCA and House: This picture is taken from the UAV looking back at the house. The DCA we located is about ¼ mile from our house. There are 8 drones in this picture indicated by the red arrows.

Do you have access to a drone (unmanned aerial vehicle – UAV)? Do you think honey bees are one of the most fascinating creatures on the planet? Do you enjoy contributing to efforts that are bigger than yourself? If you answered yes to these three questions, you can be a citizen scientist by locating drone congregation areas (DCA) near you. It is easy, exciting, and fulfilling to contribute to worldwide research about honey bees.

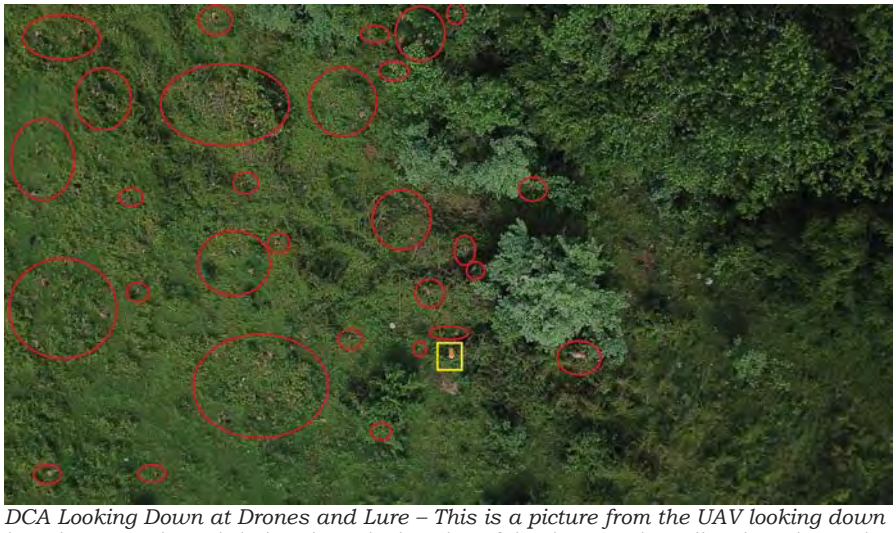
I first heard about this citizen scientist opportunity from Georgia Master Beekeeper Julia Mahood when she explained her breakthrough idea of using a UAV to find DCAs on the "Beekeeper Confidential" podcast (Episode 45, 1/22/2020). She talked about the value of drones, honey bee genetics and reproduction. She then invited beekeepers to locate and map DCAs on the website she created, **www.mapmydca.com.** I thought "That sounds fun and becoming a citizen scientist is IT right now: people all over the world doing their small part that together makes a major contribution and impact. I'll try it."

I went to **www.mapmydca.com** to learn how to locate a DCA, how to fashion a lure that simulates a virgin queen, and how to attach the lure to the UAV. The website is clear and easy to understand. I then went to the Facebook page **https://www.facebook.com/mapmydca** and asked a few clarifying questions. The hardest part was obtaining queen pheromone. I happened to run into a queen breeder who had artificial queen pheromone sticks so I bought a few from her for a $1 each. I fashioned my lure using a small pill bottle with holes drilled through it so air can pass through and the queen pheromone can be detected by the drones. I inserted my queen pheromone stick into the bottle and tied the bottle to the UAV using about 20 feet of thread. Could it really be that simple? It turns out: yes, it is that simple.

I looked at the weather forecast to find a sunny afternoon in mid-June and made a date with my husband for him to fly his UAV with my lure attached. The first time we flew, we went out in one direction from our house. We flew over a few of my hives and sure enough, several drones came up to investigate. The queen pheromone lure worked! We were thrilled at this small success. We flew a bit further but did not find anything more, so decided that was a good enough practice run for our first attempt.

A few days later, we flew a second time in a different direction and BOOM! We found a DCA less than ¼ mile from our house. It was exactly as Mahood described: a depression in the landscape surrounded by trees with a stream delineating one side. It was exciting to see hundreds of drones flying around the lure, darting and racing in a blur of interest. After we flew the UAV safely home, I added my DCA and video to **www.mapmydca.com**. Success!

As a beekeeper with 11 hives within ¼ mile of this DCA, I wondered what this might indicate for my



DCA Looking Down at Drones and Lure – This is a picture from the UAV looking down into the DCA. The red circles show the location of the drones. The yellow box shows the lure. For video of drones flying in the DCA, go to ***http://mapmydca.com/detail/?id=14***

colonies. Research shows that drones fly to a DCA closer to their own hive and virgin queens fly to a DCA farther away from their own hive. Drones fly to the nearest DCA so they can invest energy flying longer in the DCA. Being in the DCA longer increases the probability of being present when a virgin queen enters the DCA. Drones return to their hives to refuel and then go back out the DCA, often multiple times a day. The shorter the travel distance from the hive to the DCA, the longer the drone can stay airborne in the DCA to increase his chances of mating with a virgin queen (Sorel et al., 2018).

Conversely, a virgin queen flies to a DCA farther away from her own hive. This makes it less likely that she will be in the same DCA as her brothers which reduces the probability of inbreeding. The research shows virgin queens can fly up to five miles away to reach a DCA. She stays in the DCA a relatively short amount of time and then flies back home to her hive. She often takes just one mating flight, but studies show she may go out on subsequent days as well. (Koeniger et al, 2014)

We also know that beekeeping is local and impacted by local conditions such as climate, terrain, and available forage. My house, farm and 11 of my colonies are located in a valley in the Appalachia Mountains in southeastern Kentucky. The valley floor is 1000 feet below a ridge that surrounds the valley on all sides. There is a one narrow pass to exit the mountains. In addition, my neighbor located ½ mile towards the mountain pass has 11 colonies as well. Our 22 colonies, my 11 and my neighbor's 11, are at least partially restricted by altitude from flying the several miles in any direction we often read about.

Drone Lure: The lure is a pill bottle with holes drilled into it. There is an artificial queen pheromone stick inside the bottle. The lure hangs on a thread about 20 feet below the flying UAV.

UAV on Landing Pad: My husband's unmanned aerial vehicle (UAV) is a DJI Mavic Pro.

Bee behavior and outcomes are also influenced by beekeeping methods. I practice natural beekeeping following most of the recommendations of Dr. Thomas Seeley and his Darwinian beekeeping guidelines. For example, I do nothing to prevent swarming and instead, catch the swarms when I can reach them. I also space my hives as far apart from each other as possible to reduce pathogen transfer due to drifting (Seeley, 2019). Greater distance between hives also ensures virgin queens returning from mating flights enter the correct hive (Gabka, 2018).

In Spring 2020, I witnessed 16 swarms from the 11 colonies located at my house. Several colonies emitted both a primary swarm and multiple afterswarms. Of those 16 swarms, I caught 12 of them. The other four were too high in a tree for me to retrieve. Every one of the 12 swarms I caught and every one of my original 11 colonies became queenright all by themselves. Every one. Not a single queenless hive. As unusual as this may seem, a nearly identical level of swarming and queenright success has occurred for my colonies for the past several years.

Understanding the science of queens and drones flying to DCAs, my beekeeping methods, the topography of my farm location, and my positive queenright results, I could now add to this the knowledge that there is a DCA located ¼ mile from my 11 colonies. Could this close DCA be a contributing factor to the high queenright results? The science says it is not likely that my virgin queens are flying to this close-by DCA and instead, are flying to a farther away DCA. Yet, with many colonies in my isolated valley surrounded by 1000-foot high mountains, could it be that my virgin queens are using this close DCA anyway to avoid flying over the mountains? Could it be that because of the high number of colonies (22) flooding the close DCA with drones that my virgin queens would have a lower probability of mating with drones from their own colony? Would not flying just ¼ mile to the DCA mean less opportunity for virgin queens to get eaten by a bird, become lost, or blown off course and therefore, result in higher queenright success?

The truth is, I do not know. I do not know why my queenright results are so high. Without DNA testing and rigorous studies, I cannot conclude that my virgin queens are flying to the DCA located ¼ mile from my house. What I can do is continue to track swarming and queenright results for my colonies located at my isolated valley and compare to results

for my other colonies located in four separate out-apiaries. Because my beekeeping methods are the same for all my colonies, the major differences between multiple apiaries are terrain and DCA location. I can continue to learn and gather data to try to understand bee biology and behaviors. I will continue to wonder and think and study.

This is one of the aspects I enjoy most about beekeeping. There are continuous opportunities to merge science with experiences, combining the details of location, methods, and observation. Beekeeping has it all. It is mentally challenging to apply new learning and gather data while being cautious to not jump to conclusions. There is much we do not yet understand about bees and beekeeping.

You are likely a beekeeper somewhere in the world who is working to grow your knowledge of bees and to apply that knowledge to increase your success as a beekeeper. You likely have a curiosity about bee biology and behaviors, and you work hard to apply what you learn to understanding your bees. One way to do this is to try to find a DCA using a UAV. I invite you to contribute to the worldwide knowledge of DCA locations following the methods Julia Mahood developed. In doing so, you will deepen your own understanding of colony reproduction and possibly gain new insight into your own colonies' behavior and your beekeeping methods. It is not often we have an opportunity to contribute to an effort that is this exciting, easy, and useful. I hope you locate a DCA, place it on **www.mapmydca.com,** and in doing so, become a citizen scientist. BC

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Theresa Martin has 17 hives in southeastern Kentucky. She focuses on keeping healthy, alive bees by using more natural practices. She is the President of her local bee club and the Secretary of the Kentucky State Beekeepers Association. Theresa is pursuing her master beekeeper certification at Cornell University. You can see video of the DCA Theresa and her husband found at ***http://mapmydca.com/detail/?id=14***

U.S. HONEY PRODUCERS

Pamela **Parker**

The price of honey on US shelves has almost doubled over the past 10 years. Pamela Parker photo

Skyrocketing demand for honey has meant that prices in the U.S. have almost doubled over the past decade – so why are American beekeepers struggling to make ends meet?

David Bradshaw has been a beekeeper for almost half a century.

Born in Pasadena, and raised in California's rural Central Valley, he purchased his first 200 hives while still in high school. He then worked alongside his father until they each had about 2,000.

With the average price of honey on US supermarket shelves at **$8.09 (£6.48) per pound (454g) last month,** up from $4.66 in May 2010, you'd think that it was boom times for Mr. Bradshaw and the other 36,000 or so US beekeepers.

Instead, many are on the brink of going out of business, despite the big price rise as U.S. honey consumption has grown by more than a third over the same period.

"It's hard," says the 63-year-old. "It's hard selling the honey.

"I do some commercial extraction for other beekeepers. And since they can't sell their honey either, they have problems paying me."

"These days I get paid only $1.25 to $1.50 per pound of honey, with prices falling further. To break even, I need to be paid at least $2 per pound, which hasn't happened for about three years."

So what is the cause of the problem? There are a number of factors, from the U.S. importing huge volumes of low-cost honey from overseas, to insufficient labelling rules, and even outright cheating - whereby honey is mixed with cheaper ingredients, such as corn syrup.

A trip to any U.S. grocery store indicates the issue regarding honey labels. There are shelves stacked with honey jars labelled "U.S. grade A".

So a patriotic American might think that this is the very best quality honey to buy. Unfortunately it doesn't actually mean that the honey in question is from the U.S.

Instead the term "U.S. grade A" is a guideline issued by the United States Department of Agriculture (USDA) for some metrics of honey, such as moisture, content, colour and clarity. Grades B and C are also available.

America's beekeepers say that they are struggling. Pamela Parker photo

So a jar of A could be labelled as such and then also say, often in very small print, that it is a mixture of honeys from a number of other countries.

The problem for US beekeepers is that while they say they need to be paid $2 per pound to break even, **foreign honey can be imported for as little as 81 cents per pound.**

The US imports its honey from a number countries, with India the biggest source, followed by Vietnam, Argentina and Brazil.

So the people making big profits from honey sales in the U.S. are the importers and honey retail companies, not the domestic beekeepers.

However, Nicholas Sargeantson, owner of the largest importer of honey to the U.S., Sunland Trading, points out that the imports are vital to meet demand.

"Imported honey, in general, is coming in large volumes because the consumption here is over 500m lb (227m kg) [per year] and only 150m lb are produced domestically," he says.

While it is perfectly legal to import and sell foreign honey in the U.S. if the origin is stated, in some cases the country or countries of origin can be illegally hidden or mislabelled. The honey can also have been secretly and fraudulently adulterated, or bulked out, with corn syrup or other cheaper ingredients.

Sweetwater Science Labs, an independent testing lab in Missouri, says that roughly 35-40% of consumer-instigated honey testing it conducted over the past 18 months was either adulterated, of false origin, or of poor quality because it had been overly processed, such as being overheated.

"I have been seeing more and more testing requests to verify the origin of honey, [not just from consumers] but even from growers and smaller packers testing the origins of competitor products," says Sweetwater's chief chemist James Gawenis.

Accusations of fraud have dogged the U.S. honey trade for decades and Mitchell Weinberg, chief executive of food fraud detection agency Inscatech, says things remain as bad as ever. "I've done numerous honey investigations over the past 10 years, and I can say with certainty that the problem of honey fraud today is still huge,"

The problem for the U.S. honey industry in dealing with this all is that the sector remains largely self-regulated, with very little government monitoring.

Could the honey you buy actually contain other ingredients, such as added corn syrup?

The U.S. gets more than two-thirds of its honey from overseas, with India its biggest supplier.

Take the USDA's grading system – it isn't actually enforced. Honeys are not routinely tested by the department, or any other federal agency.

Michael Roberts, executive director at the Resnick Centre for Food Law and Policy at the University of California Los Angeles School of Law, says the government must do more to police the U.S. honey sector.

"There is insufficient coordination between government agencies to police honey fraud in a way that would make it effective," he says.

This lack of coordination is quickly revealed when the USDA was asked whether its honey grading system should be strengthened. It replied to the BBC that "overall authority for food labelling is the responsibility of the FDA [the U.S. Food and Drug Administration, which is part of the US Department of Health and Human Services]".

Its response was similar when it was asked what it was doing about the problem of adulterated honey: "Again this is ultimately the authority of the FDA."

A spokesman for the FDA said that it "does not have any regulations governing country of origin labelling." Instead it said it was a matter for the USDA.

However, he added that regarding honey adulteration: "The FDA considers product labelling, and the statements and representations made therein, on a case-by-case basis. [And] all statements on a food label must be truthful and not misleading."

The problem of adulterated foreign honey coming into the U.S. is the biggest issue, says Ron Phipps, of the International Federation of Beekeepers Associations.

"The reality is not that American beekeepers are non-competitive," he says. "The problem is other countries are using means of production, which have been observed and documented, that allow production of huge quantities of adulterated honey whose production costs are extremely low."

A jar can say "US grade A", but then the small print can reveal that the honey is from other countries.

Beekeeper David Bradshaw is clear about what he would like to see. "I'd like to see [more] prominent labelling of the country of origin of all honey sold," he says.

He also hopes to see stronger enforcement to protect U.S. beekeepers from adulterated honey, or honey that tries to hide its country of origin, both of which suppress prices.

Chris Hiatt, vice president of the American Honey Producers Association, says that something has to be done. "We need a decent price to keep our businesses going," he says. "It is a serious problem." BC

U.S. beekeepers are also having to deal with health threats to their bees, such as a deadly mite. Pamela Parker photo

Ways To Move Bees, Part II

In Early 19th Century

Jim **Thompson**

Trailers

The trailers used during this time period were high because they had wagon wheels. Thus you would have to make sure the ground was solid. There were no ramps so the hives would have to be hefted onto the trailer. On the other hand, if you loaded the trailer right you could unhitch it in the pollination area and the hives being so high wouldn't be bothered with the weeds.

Wagons

A wagon full of beehives just makes me cringe, thinking of how much work it would take to load the hives. Unload would be slightly easier but leaves you always looking for a place to stand. Even with a helper it is a lot of work.

A spring wagon does very well for a small load of bees. Photo in 1911 Gleanings.

Rack made in California especially for hauling bees. Photo in 1911 Gleanings.

F.B. Cavanagh's Jackson automobile with trailer for carrying bees and supplies.

Two wheeled Cart

There are several two wheeled carts on the market, but the pictured one works well. It was homemade and has large wheels and nose deck that is large enough to fit under most hives. However it is heavy, so I usually look for a younger helper to help load it onto the trailer if there isn't room to wheel it on.

Last year I found an aluminum model that I like well. Besides being lighter, the tires are solid, and it has fold down extra set of wheels.

Four wheeled cart

Several years ago I purchased a four wheeled cart to haul my honey judging equipment. It has a folding handle and the platform is large enough to place a beehive. Because it has four-inch wheels, it is good to wheel on hard smooth surfaces but is difficult to pull through grass and gravel.

Cars used for bee vehicles

In 1906 G.M. Doolittle used his car for hauling his bees and bee equipment to his out-yards. When he wasn't using it for bees, he was using it to haul his friends and guests.

Beekeepers used many different models of cars like a Rambler, Buick, Cadillac and more to haul equipment. An automobile could be hooked up to power a saw blade and cut fire wood.

1906 Doolittle arriving home with a part of his out apiary comb honey crop.

Feb 1, 1909 Gleanings

Cars modified into a bee vehicle

Sometimes a car is modified to haul more packages, nucs, or hives. In this picture, we see bees being unloaded from a box car in 1915. The car was once an old touring car.

Unloading bees from box car. Picture from July 15, 1915 Gleanings. Truck body placed on old touring car.

Trucks for hauling bees

It seems by the pictures of hauling beehives by truck the practice was to throw the hives in or on in any direction and see how high you could get the load. Maybe the trucks didn't go as fast as the ones today, but we have to worry about the frames rocking within the hive and make sure the frames are parallel to the length of the vehicle. The entrances are placed to the rear, so the wind created by the movement of the truck doesn't get forced into the hive.

I don't know what type of truck George J. Van de Vord used, but he loaded 41 hives on it using only tobacco smoke. I hope he didn't have to go very far as I see only one rope holding the load. He was hauling bees in the daylight, which I have never done.

Here is a picture of Danielson's International Auto Wagon which may have been a pickup. It looks as if he secured the load well and it was a good thing as he drove thru some mud. It looks like his fun is just beginning and I hope that he has some galoshes.

Several different types of trucks were used to haul bees. The favorite seems to be Reo, but Ford, Chase, International, and others were used.

Hauling bees in a boat

There were several pictures of moving bees by boat from 1910 to 1915, so it was tough choosing one picture. However I wonder if it was hard to move the hives in the daylight or if the beekeepers had to wait until dark to release them? Was it difficult to unload the hives that were stacked on the roof of the boat? All the boats looked similar, except for the paddle wheel boat that A.I. Root used to take bees to Florida.

Bees being moved by boat. Cover of Gleanings in Bee Culture June 1, 1914.

George J. Van de Vord moving 41 colonies of bees, using only tobacco smoke to keep them in the hives. Picture in July 15, 1912 Gleanings.

Danielson's International auto wagon, loaded ready for a trip to an outyard. April 1, 1913

Unusual bee vehicles

1910, A steam engine was used to move four wagons of bees in Canada.

This 1930 Model A Ford two door sedan is owned and built by EAS Master Beekeeper Allen Hayes. It has a Ford 302 cubic inch V8 engine, with a four-barrel carburetor, a Ford Top Loader four speed manual transmission and a Ford 9" rear end with 3.50 gears. Allen or should I say "The Gadget Guy" as some EAS people know him, has taken honey to some of the car shows where he takes his car.

1910 Moving four wagons of bees in Canada.

My 2004 Chevrolet SSR, although I often refer to it as a car, it is really a convertible truck. It has a 300 horsepower engine that has been modified by adding a supercharger, power chip, and a special exhaust, so it now produces more than 500 horsepower. It didn't balk one bit when I was hauling a swarm that I had hived. BC

References:

Gleanings in Bee Culture, 1883 - 1915
Photograph of Allen Hayes' 30 Ford
Photograph of my 2004 Chevrolet SSR

The purpose of life is the expansion of happiness.

Sher **Hackwell**

TASTEFUL BEES

Tasteful Bees

Food surprises, delights and even disgusts. Today's chefs aim to engage peoples' senses and emotions; the eating experience being highly subjective, as what one person considers delicious and comforting, another finds disagreeable. Unfamiliar foods expand the palate beyond its quotidian comfort-zone, and some of these unusual foods can be credited to bees. Bees contribute to our culinary landscape in myriad ways – as pollinators and ingredients and through by-products like honey, honeycomb, and beeswax. The following bee-forward dishes will surprise, delight, and may even disgust . . .

SURPRISE Grilled Sunflower Heads

Flowers from honey plants like clover, sweet lavender, and spicy marigolds steeped in tisanes or as salad garnishes are commonplace. The sunflower, another popular pollinator plant, is known not only for its seeds, but in fact, it is entirely edible – leaves, stalk, buds, and head. Anything but a garnish, a mammoth sunflower head is the ideal grilling ingredient. These giants grow 10-12 feet high, producing a 12-inch diameter flower in under four months.

With nectar-packed disc florets and brilliantly hued, petal-like ray florets, sunflowers are composed of thousands of tiny flowers that attract multiple pollinators, chiefly bumblebees and other wild bees, and some honey bees.

A remarkable transformation occurs when the pollinated sunflower head or capitulum's disc florets transform into thousands of edible seeds. When they're ripe yet still soft, the sunflower is ready to harvest for grilling. The entire head is grilled, creating a dish that's not unlike eating corn-on-the-cob. The head's flip side is edible, too, and just requires a brief blanch pre-grilling.

Roughly 75 days in, depending on the growing zone, it's essential to regularly monitor the sunflower's

Sunflower head with seeds.

growth to ensure the head is harvested green and before its seeds forms hard shells. An excellent seed source, Baker Creek Heirloom Seed Co., recommends the Mammoth Grey Striped Sunflower for grilling because of its flavorful seeds and generous head-size.

Elote-style Grilled Mammoth Sunflower Heads Serves 2

Preparation is straightforward for this unusual dish. Pluck the petals, brush off any florets and trim the stem. Then, coat with olive oil and grill seed-side down. There are endless topping choices; corn-on-the-cob purists may prefer butter, salt, and pepper, whereas the Baker Creek Heirloom Seed Co. garnishes theirs with a mix of sundried-tomatoes and basil.

For a twist, grill these giants Mexican Street Corn (elote) style – a creamy, tangy treat!

Ingredients

Spice Blend

2 teaspoons chili powder*
¾ teaspoon ground cumin
Dash of cayenne

Sunflowers

2 giant (12-14") sunflower heads, petals plucked and stems trimmed
Olive or vegetable oil to coat heads
1 cup Mexican crema (or substitute with ½ cup sour cream and ½ cup mayonnaise)
1½ cups Cotija cheese, crumbled (or substitute with feta)
½ cup cilantro, medium chop
3 limes 1 lime squeezed and zested, 2 limes cut into wedges
Dried chili flakes—(optional) for a hit of heat

*Tajin, a Mexican go-to seasoning is a quick and easy alternative spice blend. Or, use packaged chili powder or create a custom blend based on your flavor preferences. I.e. Ground Guajillo chili pepper mild to medium heat, sweet, smoky, tangy notes. Ground Ancho chili pepper mild, chocolate, dried dark fruit. Smoked Paprika sweet and smoky. Cayenne pepper fiery flavor

Directions

Prep

Prep sunflower heads.
Make spice blend by mixing together chili powder, cumin and cayenne.
Mix Mexican crema with the spice blend and the zest and juice of one lime.
Crumble Cotija cheese and chop cilantro.

Grill

Preheat grill to 400°F or medium-high heat.
Coat sunflower heads with oil, to prevent sticking to the grill.
When grill is hot, place oiled heads seed-side down, and cook covered for five to seven minutes.
Check after five minutes and rotate the heads for even char.
The sunflower heads are ready when seeds are slightly soft with some noticeable char. Remove from grill.

Dress

Immediately spoon on the Mexican Crema mixture, top with the Cotija cheese and cilantro. Squeeze a wedge of lime over each head and sprinkle to-taste with chili flakes.

Eat

Serve with a plate of lime wedges and more chili flakes. Enjoy it corn-on-the-cob style! Or, dig in with a fork.

DISGUST Asian Giant Hornets

Next, a somewhat jarring segue to another over-sized edible: the murder hornet. While not a bee, it is classified in the same insect order, Hymenoptera. Sensationalized as murder hornets, they're more accurately known as Asian Giant Hornets, or its sub-species, Japanese Giant Hornets. Known colloquially in Japan as suzumebachi, these insects have recently gained North American notoriety due to their capacity to launch aggressive attacks on honey bees.

Insects as ingredients aren't the novelty they once were. Think, house-cricket pasta and bread flour, or insect ice-cream, burgers, and protein bars. Nearly two billion people eat insects globally, yet Western society is slow to embrace this alternate protein – widely considered a means to decrease bovine-generated greenhouse gases vs. a coveted delicacy.

These giant hornets are a featured ingredient in some curious Japanese recipes – a protein in Sunomono salad and an infusion in Shōchū

Shochu Japanese Hornet liquor.

liquor. Japanese cuisine enthusiasts will be familiar with Sunomono salad, a starter of thinly sliced cucumber marinated in rice vinegar and soy with wakame seaweed, cellophane noodles, and fresh shrimp. The giant hornet version swaps out shrimp for hornet larvae, lending the dish a rich, creamy note that juxtaposes the tart cucumber slices.

In a number of Japan's rural regions, giant hornet venom is added to a traditional distilled spirit known as Shōchū. According to Yabai.com, live hornets are placed into the alcohol to infuse it with their potent venom, which they release while struggling to survive. The venom is said to provide multiple health benefits—increased energy, healthy skin, and a generous dose of vitamin C.

Grains used in the distillation process, i.e., barley, rice, or buckwheat, define Shōchū's taste, the giant hornets adding earthy charcoal and savory notes. The hornets are fermented in alcohol for approximately three years and remain in the bottle once set to imbibe – guaranteeing a portion or two of hornet parts with each pour.

DELIGHT Beeswax-coated Canelés

A more palatable bee-centric option is the beeswax-coated canelé – a centuries-old French pastry using beeswax as the key to its crispy exterior. Pronounced can-eh-LAY, it's essentially a two-bite cake that tempts with a light, creamy vanilla,

Beeswax-coated Canelés

and rum-infused center, encased in a crunchy caramelized shell. French for fluted, canelés are baked in copper, fluted molds coated with white-oil, bakery-speak for a beeswax, butter mixture.

Beeswax's purpose is threefold: in addition to creating a glossy, crunchy exterior, its distinct mouthfeel in stark contrast to its creamy center, beeswax prevents the batter from sticking to the mold and extends its freshness by sealing the pastry. Tip: Although not recommended for canelé molds, repeatedly coating a sturdier baking pan with beeswax produces a convenient non-stick coating.

The canelé has seen multiple transformations since its inception centuries ago in Bordeaux, France. Its exact provenance is unclear; however, the consensus is that between the early and high Renaissance – 15th to 18th century, Bordeaux wineries used egg whites as a fining agent. They gifted the unused egg yolks to the nearby Couvent (Convent) des Annonciades whose nuns baked the pastry's first rendition for the town's needy children.

The canelé virtually disappeared due to government-imposed regulations forbidding the use of specific ingredients, the dismantling of trades' guilds, and also due to the French Revolution.

In the late 20th century, the traditional canelé was revived when nearly 100 Bordelaise pastry chefs formed a society, the Confrérie (Brotherhood) du Canelé de Bordeaux, to ensure its authenticity. Forty years on, the Brotherhood holds firm, protecting the integrity of this storied sweet.

Making the pastry requires precision and time – happily, the bulk of it is hands-off. There are multiple recipes online, although by following a few steps, canelé victory is within reach.

Working with copper molds is essential – to ensure optimal heat-conductivity, quality ingredients, and unbleached, food-grade beeswax. The batter consists of the usual suspects – egg yolks, sugar, and flour. Accompanied by vanilla-bean seeds and dark rum, all are gently combined to prevent air bubbles from forming, then refrigerated overnight. Before baking, equal parts butter and beeswax are slowly melted together, poured into and out of warmed molds, to form the white-oil coating, then chilled to set. The batter is poured into the molds, baked for an hour, and immediately released to cool, while the beeswax and caramelized sugars set to develop its crunchy, bittersweet shell. Finally, the canelés are ready to eat. Delightful.

SOURCES

Mammoth Sunflower Seeds
https://www.rareseeds.com/
Copper Molds https://debuyer-usa.com/
Beeswax Local beekeepers or https://glorybee.com/
Confrérie du Canelé de Bordeaux Facebook @gateauxbordelais

Sher Hackwell is a culinary writer focusing on food travel, history, and sustainability. She's written and developed recipes for Edible Publications, was a columnist for the Glacier Media Group and has contributed to *Uppercase Magazine*. She is a Culinary Historian book reviewer and an editor for Headlines publication. As an artisanal food promotions specialist, she connects chefs with farmers and purveyors – including apiary goods. BC

"I value her creative ideas, sharp writing & reliable professionalism." –
DEBBRA MIKAELSEN,
Editor Edible Vancouver & Wine Country

The Impossibility Of Robotic Pollinators

R. Michael **Magnini**

"One morning in early June a strange sound woke him. A sound akin to honey bees, yet it was mechanical and wispy. Unsure of what he heard, he staggered sleepily to his bedroom window. In the vast machine cultivated field across the county road from his old house, sunlight glittered from tens of thousands of tiny insects moving in symmetrical waves over the soybeans in full bloom. He had been asleep. He rubbed his eyes with his fists to clear the dream fog from his vision. The clicking, whizzing and whirring of the tiny objects did not sound right. They were not alive; they were machines.

Sunlight reflected into his weary eyes; he attempted to focus. Now, he could see the signpost. The corporate name blurred – *something Dynamic* – but the purpose clear. Food production by their standards, by their controls was their mandate. No longer was natural selection viable. The Corporate Estate with its power and control, its deep pockets and influence, owners of biotechnology and agricultural lands employ the bioengineers who determine the method and the outcome. They determined the *New World Order.*

His backyard market garden (subject to inspection for patent infringement) and his dying bees were relics of the past…." [from the short story *Time Enough*].

PROPHETIC WORDS?

Concern regarding changing climate, pandemics and extinction event possibilities have spurred some people to seek a technological response to these challenges. Electric vehicles and Starships to Mars and the *dearmoon* are an ideological impetus towards a new, restructured Earth environment.

As if under siege, scientists and engineers are craftily designing and building the machines that will protect us from all possible dangers except perhaps the machines themselves. Following the logic of the technical revolution, of disruptive technologies and the logarithmic advancement of innovation, research into micro-machines and autonomous robots is accelerating.

Micro drones, robotic insects, piezoelectric flying machines, are modern synonyms for artificial bees. To enhance biosecurity, prevent weather related crop failures, improve profitability and reliability are all reasons to pursue a program of artificial pollinators.

An increased demand for food as the world population increases while areas of arable land declines (as per sea level rise) certainly puts pressure on agricultural lands to be more productive. The entire country of Bangladesh is at or near sea level and a rise of oceanic water by as little as one or two feet would inundate and submerge their habitable land. All river delta areas exposed to the sea are at risk from glacier and polar ice melt as the average ocean depth increases and tides become higher. All ecosystems are locked together and what affects one affects all.

The Holocene extinction, otherwise referred to as the sixth mass extinction or Anthropocene extinction, is an ongoing extinction event of species during the present Holocene epoch as a result of human activity. The included extinctions span numerous families of plants and animals, including mammals, birds, reptiles, amphibians, fishes and invertebrates. The current rate of extinction of species is estimated at 100 to 1,000 times higher than natural background extinction rates.[1]

Low cost, low power machines that are reliable, agile, self-sustaining replicants of the endangered natural insects is the marvelous machine solution. Autonomously pollinating field crops is envisioned as one use of the micro-robots that the Harvard Research Team is developing.

Although many companies are developing mechanical bots using the insect form including ants, dragonflies, moths, hornets and butterflies[2] the interest in the bee type of micro-robot is the focus of the Harvard Research laboratory.

From Harvard University: "INSPIRED by the biology of a bee and the insect's hive behavior . . . we aim to push advances in miniature robotics and the design of compact high-energy power sources; spur innovations in ultra-low-power computing and electronic "smart" sensors; and refine coordination algorithms to manage multiple, independent machines."

WITH OR WITHOUT A.I.?

RoboBee's wingspan is 1.2 inches (3 cm), which is believed to be the smallest man-made wingspan to achieve flight. The wings can flap 120 times per second and be controlled remotely in real time. Each RoboBee weighs 0.0028 oz (80 milligrams) without a battery. It achieves flight on two wings more like a fly (Diptera spp.) than a bee sporting the four wings of the Apidae.

Apis mellifera (workers) measure approximately ½ to 5/8 inch (12-15 mm) in body length, have a wing span of ¾ to 7/8 inch (19 – 22 mm),

weigh about 113 milligrams +/- nectar and/or pollen load and can fly between 12 to 18 mph depending on winds.

Although the research engineers claim that they are not trying to displace or replace live bees, the advances in the technology of material science and artificial intelligence combined with the uncertainty in the biosphere may have unexpected outcomes.

Would it be a coincidence or at least convenient that the robot-bee should be completely immune to all pesticides, herbicides and fungicides. To relieve agricultural behemoths of costs and concerns involved with chemical contamination of live pollinators would be seen as an asset. The climate weakens, farmland skyrockets in value and the little robots are economically efficient.

Would a reliance on electro-mechanical agriculture and food production continue to erode our connection with nature? As more people dwell in cities then ever before and fewer in rural zones would anyone notice the difference?

Of course, inorganic robotic bees could not produce honey. In this instance there is hope for the natural honey bee. Should the engineers decide to pursue a program of synthetic chemical processes within the robotic bee a fully functional replacement for the natural bee could be the result. The introduction of the Cyborg insect, but we are not there yet.

Another method to accomplish the goal of artificial honey production (perhaps an intermediate way) would be to construct a nectar processing 'hive' that would merely require the robotic bees to deliver nectar to it. The design could follow this procedure: The robotic bees are integrated machines that are configured to collect nectar as well as pollen for pollination. The whisper drones would fly to and from the synthetic beehive. Upon arrival they deposit the tiny load of nectar into reception slots on the surface of the hive, then fly off to collect more. The tiny robotic bees never enter the Synthesiser Hive. The nectar that is deposited into the receptor slots flows into a large, or series of large, artificial honey stomachs. These chambers are loaded with bioengineered lactobacillus and numerous enzymes that convert the sucrose of the nectar into the fructose and glucose of honey. Vitamins, minerals and flavonoids are preserved. The 'gut' of the hive then pumps the refined liquid into evaporation trays (which may or may not be shaped in hexagons) for temperature controlled electrical evaporation and irradiated by UV light. Inside the night time robot hanger the machinery would synthesis the nectar into honey to be extracted by the owners via a 'honey flow tap'.

Should the brilliant engineers of corporate agriculture succeed in these efforts it would return the honey bee back to the wild as a relic of the past. Perhaps it would be nostalgic to keep a bee hive of 'real bees' like an old horse buggy in the barn.

That is the way some bio mechanists of the engineering world would like the future to develop. However, despite their confidence, ambition and financial resources we must look at the limitations of their objectives.

To begin with there is the power to weight ratio involved with any flying machine either mechanical or organic. Bees are efficiently powered by fructose and glucose. There are 0.01674 joules of energy per milligram of sucrose. On this small amount of energy, a honey bee can fly and work throughout the day 'refuelling' as necessary by eating some honey.

A mechanical bee would require electrical energy to power its wings and guidance system. Would a flying mechanical bee have a solar panel strapped to its back? A high efficiency lithium battery (which contains 0.000265 Watt hours of energy per milligram) would add to the weight of the robotic bee. The world's smallest commercial battery is the Cymbet EnerChip CBC005-BDC: which is a 5uAh (Lifecycle Capacity = 2.5mAh) rechargeable 1.75mm x 2.15mm x 200 microns thick solid state battery bare die to be co-packaged with other integrated circuits using wire bond attachment in a single package or multi-chip module.[3] Flight time may be limited in these small battery packages.

The challenges of flight time and re-charging could possibly be overcome using high energy radio waves, but this would still require a receiver coil and transducer circuitry with its associated weight and dimensions. Now then, if they can make the device fly it needs an autonomous guidance system (a bee's brain). To program a semiconductor computer chip which itself would have considerable relative weight would need an extremely deep and lengthy algorithm. Perhaps this problem too could be solved by a radio transmitted guidance system or possibly a combination of both.

If the power to weight ratio and guidance system problems are resolved would the robotic bee be able to work all day like a natural bee? Would the robotic bee withstand weather conditions such as rain and/or wind? Natural honey bees are very well able to fly in strong winds and withstand rain (which they very perceptively avoid).

The next hurdle for the engineers to surmount would be the actual process of pollination using mechanical pollinators – the robotic bees. The effectiveness of this method has yet to be demonstrated. The robotic bee would require the ability to locate the flower blossom, identify it as a true target and perform the pollination operation. Sensors in visible light and/or ultraviolet light would require a match to a "flower recognition" algorithm. The architecture of flowers varies in significant ways. The size of the blossom can be as small as a few millimeters across to many centimeters; the throat can vary in depth and width and some species possess 'trigger' mechanisms to access the pollen. Robotic bees would most likely need to be designed and built to service only one type of flower. All bees become covered in pollen when foraging and so too would the robotics. Could they continue to fly vis-à-vis the extra weight,

discriminate between pollinated and unpollinated blossoms? Pollination by natural bees occurs when pollen is distributed over the bee's body adhering to its hairy coat is transferred to the receptive anthers of the blossom and so too would the robotic bees become covered in pollen. These tiny grains are sticky and could become lodged in the flight mechanism or obscure the guidance system.

Also regarding guidance systems is the navigation of the robot in terms of geolocation. Could they harness GPS satellite signals to remain located within the agricultural field of their task and not drift off into wild areas?

REPLICANT OR REAL?

It certainly seems to be a fantastic proposition to recreate a pollinating insect from plastic and metal and have it perform as efficiently – or better – than a naturally evolved bee. An evolution of biological trial and error occurring over a span of 100 million years in the flowering fields of Earth. Given its size, the bee brain has an extraordinary capacity to process detailed information and make decisions for itself and for its colony. Our little bees are a marvellously adapted and efficient 'machine' capable of enormous work with abilities of 'mind' far greater than that of a small computer.

It may happen in some remote technological future (perhaps using Artificial Super Intelligence) but at this time I think it is an impossibility of material realization in the near term. Therefore, it would be most wise to care for and protect the natural bee in its role as pollinator of our agricultural crops and producers of honey – we will need them. BC

1 Wikipedia, Extinction Events, 2021

2 Defense Advanced Research Projects Agency (DARPA)

Black Hornet reconnaissance drone

Festo Controls, Esslingen am Neckar, Germany.

Ant-bots, Butterfly-bots and Dragonfly-bots

3 Cymbet Corporation. New Brighton, MN 55112

SUCCESSFUL QUEEN REARING

Daniel **Kluger**

Introduction

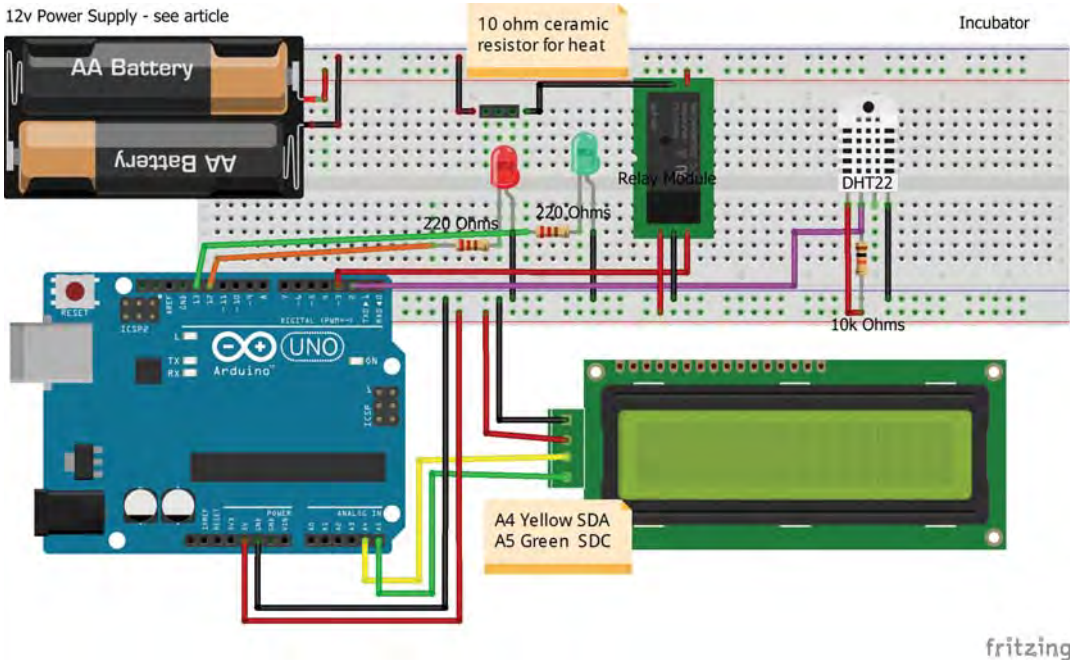
Successful queen rearing is often the key to a beekeepers long-term sustainability and self-sufficiency. Optimizing a queen rearing system involves close attention to every step of the development from selecting a breeder colony to ultimately introducing a virgin queen to her designated colony. Mistakes at any step of the queen rearing process can lead to failure, missed opportunities, and disappointment. Spring is the optimal time of year to rear honey bee queens; thus, any production delay can setback apiary plans by a season or more.

Small scale queen production relies on the honey bee's natural instinct to raise queen cells under certain conditions. Most amateur beekeepers only require a dozen or two honey bee queens annually to sustain their resource or production colonies. A common technique practiced in queen rearing is the use of a queen-less "starter" and a queen-right "finisher" colony. In a queen-right finisher colony, any started cells must be finished by necessity above a queen excluder, separated from the brood nest. Early Spring is marked at times with wide temperature variations. With cold weather, the colony will cluster and the started cells may not be ideally cared for and kept warm by nurse bees. Strengthening these "finisher" colonies can help alleviate these concerns, however, this remains a significant potential problem with the use of queen-right "finisher" colonies.

Incubation of capped honey bee queen cells accounts for more than half the time a cell would remain in a "finisher" colony prior to emergence. The four day old larvae is selected for grafting and is capped on its ninth day. These five days are spent being fed royal jelly vigorously by nurse bees prior to capping and pupation. The capped cell is normally incubated for seven days prior to emergence on day 16. Several studies have demonstrated ideal incubation temperatures about 93°F. Cooling of the queen cell may delay emergence and ultimately disrupt the adult queen development. It is this period of development we wish to control with our queen cell incubator.

Materials

My goal of constructing a queen cell incubator is that it met the following criteria: inexpensive, reliable, use of materials on hand, and potentially expandable to meet any future needs. I have had a recent interest in low-cost microcomputers, and their use as microcontrollers. My first incubator project was constructed with the use of a Raspberry Pi as the controller. The Raspberry Pi was introduced in 2012 by the Raspberry Pi foundation. Their goal is to make powerful, inexpensive computers widely available to stimulate interest in STEM (science, technology, electronics, and math) in young people. By every measure, the Raspberry Pi has been a tremendous success with



Incubator breadboard wiring diagram.

over 30 million machines produced making it the best-selling computer of all time.

Although a $5 Raspberry Pi Zero serves well as the microcontroller for my first incubator project, this current project is controlled by a generic Arduino Uno R3 compatible board. I chose the Arduino platform due to its extremely low cost, ready availability of voltage compatible devices, reliability, and simplicity in terms of programming and operation. Though the Raspberry Pi is much more capable, I found Arduinos easier to configure for this single-purposed task. Both of these devices are open-source "free" (as-in-speech) with a thriving online community of users and readily available tutorials.

For operation, the microcontroller needs to monitor temperature and humidity and activating a heating element as appropriate, safely maintaining optimal temperatures for queen cell development. Fortunately, high precision temperature and humidity sensors are available inexpensively as are relays for switching on and off heating elements, and optional LCD displays can nicely render useful operational information in real-time. Alternatively, this data can be collected and shared locally on an intranet or even a cloud-based platform. For the incubator housing, I chose a disposable Styrofoam cooler sent to me at work. Because I am reluctant to connect my incubator to higher (and potentially dangerous) voltage, I determined the incubator could be adequately heated with a 10 ohm ceramic resistor (rated at 20 watts) and a 12v wall power supply scavenged from an old telephone answering machine.

In general, overseas suppliers (eBAY, BangGood.com, Alibaba, etc.) can provide these components at a fraction of the cost. Shipping delays on the order of two to three months are the main disadvantage. Domestic suppliers Amazon.com, Adafruit.com, etc., can provide much better service, unfortunately often at a higher price.

Part Description	Cost	Comment
Arduino Uno R3 or compatible microcontroller	$3 - 20	Purchasing a brand name device helps support the non-profit Arduino foundation. Smaller less expensive devices such as Arduino Nano should be compatible assuming a 5v device is used
1 channel 5v relay board	$1 - 4	Some models are "optically isolated" allowing them to avoid drawing power from the microcontroller itself. Can be useful devices smaller than Arduino Uno R3
DHT-22 Temperature Humidity Sensor	$3 - 7	Accuracy reported as +/- 0.5 C and +/- 2% RH. A 10k ohm low power resistor is needed for use to minimize "noise" in the circuit and ensure proper functioning
Heating element	$2	An incandescent light bulb can be used but in small spaces, there is extreme risk of fire. Additionally, line voltages should not be used if you are unfamiliar with proper techniques. Line voltage can be deadly. I used a 10 ohm ceramic resistor rated for 20W.
Optional 5v 16 x 2 LCD Display	$2 - 5	To simplify wiring of this device - look for I2C serial communication in the description
Optional 5 volt LED	$1 - 5	Can be used to determine operational status – i.e Red Led "Heat on", etc. This should be driven in line with a 220 ohm resistor to limit current draw. Kits of a variety of low priced, low power resistors are readily available.
Optional "breadboard"	$2 - 5	Useful in prototyping circuits before committing to a dedicated circuit board
Styrofoam container		Any suitable size somewhat insulated box can be used. An old hive box might be an attractive option.
A few small gauge "jumper" wires to hook it all up		
Power supply		See discussion below

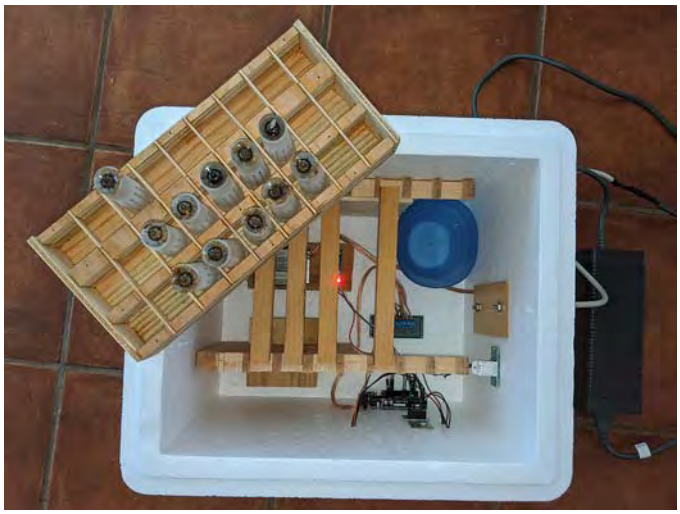
The Arduino's can accept up to 12v "raw" unregulated power. Alternatively, the Uno can be powered by any USB charger supplying more than 1000 mA. To calculate power supply requirements for the heating element, you need to know both the power supply output voltage (presumably 12v), and the resistance of the heating element in Ohms. It is important not to draw too much power from a power supply to avoid permanently damaging it. Consider the label rating the Amperes on a power supply as an upper (peak) limit. In general, you should only draw 60% of this peak to avoid damaging this power supply.

The relationship of power, voltage, current, and resistance are as follows:

Voltage = Current (Amperes) x Resistance (Ohms)
- *Ohms law*

Power (Watts) = Voltage x Current (Amperes)
- *Power law equation*

In a mechanical system, such as a waterfall, voltage is the height of the waterfall and the current is the amount of water falling. The resistance could be thought of any limit to the amount of water flowing, such as a water-wheel



Incubator with hair rollers.

Incubator inside view.

turning in the current. In the incubator, with use of a 10 Ohm ceramic resistor, a 12 volt power supply needs to supply at least 1.2 Amperes (ideally 2.0 or more Amperes to avoid permanently damaging the power supply) as 12v/10 Ohm = 1.2 Amperes

During operation, the amount of power consumed is dissipated as heat. Using the Power law equation, 12 Volts at 1.2 Amperes = 14.4 Watts of power. It is important the ceramic resistor is rated significantly above this amount or the resistor is at risk of melting and can become hazardous before it fails completely.

New regulated power supplies can be expensive. If you do not have a suitable power supply available, I would consider use of an old XBOX power supply. These power supplies can often be found at thrift stores inexpensively and are surprisingly durable. These devices can provide over 15 amps at 12 volts supplying over 150 watts. These provide far more power than needed for my small scale operation, but remain a good low-cost option. As an added bonus, these power supplies can be easily unplugged and stored within the incubator when not in use. For converting such a device into a powers supply for the incubator see: **https://www.instructables.com/id/Convert-Xbox-Power-Supply-to-Benchtop-12v-Psu/** Excluding the power supply, all of these parts together should be available for less than $15 from overseas suppliers.

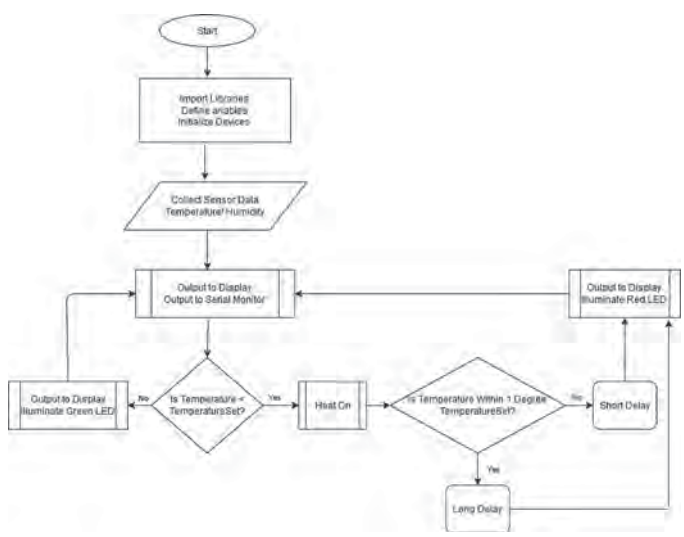
Methods

To begin, you must establish communication with the Arduino board in order to download instructions to it. Fortunately, the Arduino IDE development environment is available for free download from **https://www.arduino.cc/en/Main/Software**. After installing this environment, you need to identify which Arduino device you are using under *Tools* ➔ *Board* menu. Occasionally, the serial "COM port" needs to be assigned in the Arduino IDE to communicate with your device. The correct "COM port" in use can be identified in Windows by checking *Windows* ➔ *Control Panel* ➔ *Device Manager* ➔ *Ports (Com & LPT)*. Make sure the COM port in use matches the COM port selected in the Arduino IDE.

Arduino relies on "libraries" of code that allow it to interpret your instructions. Many of these libraries are automatically installed, though some may need to be added. For this project we need to add the following libraries: Adafruit_Sensor library, DHT sensor library by Adafruit, and the LiquidCrystal_I2C.h library. These can be installed into the Arduino IDE under *Tools* ➔ *Manage Libraries* and installing the library as needed.

The code required is a simple loop run endlessly once devices are initialized and variables are set. The Arduino reads temperature and humidity and compares these readings to the desired settings, either turning on or off the heating element as indicated. Results are displayed on the LCD and are also sent to the serial port for monitoring.

The code to run this project can be found at: https://github.com/vabeek/Arduincubator/. The variable "TemperatureSet" is set to 92.5 degrees by default. This can be changed if desired by simply changing the value at the beginning of the program. Once this program is loaded into the Arduino IDE, it must be first compiled and sent to the Arduino. Under *Sketch* ➔ *Upload* menu, the Arduino IDE starts the compiler, and if successful, will push the program out to the Arduino. Included in the program is output to the serial monitor to aid in debugging if things do not work correctly. The serial monitor is accessed on the menu *Tools* ➔ *Serial Monitor* on the Arduino IDE.



Incubator Flowsheet

It is at this point that the controller can be wired to control the incubator. The LCD as well as the LED's are optional. The device status could be determined through the serial monitor, or alternatively, a web-based server application could be added. Some versions of Arduino boards are supplied with built-in wifi making webservers relatively easy to configure. To limit the scope of this project, I excluded this feature.

Construction

After programming the microcontroller and wiring the components, construction of the incubator can be individualized based on required capacity and material on hand.

A hole is cut in the side of the Styrofoam for affixing the LCD display and operational LED's. Access for power supply cable is made on the side. Hot glue was applied to the various components to secure them to the inside of the incubator. Racks for holding grafting frames were made from scrap wood and a ¾ inch wide slot cut was made with a dado blade in order to secure these frames in place. A platform was also constructed from scrap wood to hold securely "hair-roller" type cages. Images of various other types and configurations can be found readily on the internet for more ideas.

Discussion

Ideal incubation temperature for honey bee development has been reported to range between 32-35°C in a number of studies. Preferred relative humidity during incubation is thought to range between 50-80% with in-vitro experiments demonstrating a preference for 75%.

Although relative humidity is not controlled by this incubator, humidity can be closely monitored. To easily increase the humidity, a sponge or bowel of water can be added to the incubation chamber. As an added feature, components from an old ultrasonic humidifier can easily be used and controlled with a separate relay device in order to actively increase chamber humidity if needed.

Incubating capped queen cells in a controlled environment can be an important part of a queen rearing system. Added control of any system allows for less variation and potentially greater chances of success. This incubator is intended to limit the effects of cold and unpredictable early spring weather on the rearing of honey bee queens. Beekeepers of any scale can benefit from reducing their reliance on external inputs to sustain their operation. Successful queen rearing can help the beekeeper in these efforts. This incubator, utilizing the Arduino microcontroller, can scale to a much larger capacity as needed, though line voltage if used can be hazardous.

As an inexpensive project, this incubator provides an opportunity to construct a useful piece of equipment and learn more about microcontrollers and simple programming. Beekeeping is an endlessly fascinating hobby with aspects of animal husbandry, entomology, woodworking, and now with the availability of inexpensive microcontrollers, computer technology. Perhaps this project may spark an interest in beekeeping among technology enthusiasts in our lives. BC

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The Foraging Season

Pollination, only a part of the bees' foraging life

Pollen, pollination, and the pollen flow

For us, it has always been about *honey*. Our long, long association with honey bees has always been for the honey. Yes, I know. Our ancestors also ate some of the bee brood and probably downed some pollen in the wax as they ate the honey; but primarily, what our forebearers wanted to eat was – honey. It has only been in recent years that our beekeeping interest really began to treat the need for both natural and supplemental pollination with the respect it deserved. Pollen and pollination – historically – have essentially not gotten their due.

I mean, for crying out loud, we even call it the *"nectar flow."* On the rarest of occasions, an enlightened presenter may refer to the *"pollen flow"* almost as an afterthought or as a lesser event. In the biological scheme of things, it is clear that the pollen *"flow"* is just as critical as the nectar *"flow."* Between the two, the big difference is that we are getting honey from the nectar flow and that delectable acquisition seems to sate our primal need for sweet food. *Ahhh, the joy of the successful nectar flow.* But from the bees' standpoint, acquiring pollen is absolutely as critical as acquiring nectar. Either, without the other, is a profoundly unbalanced bee diet[1]. Then it really gets complicated – pollination happens.

As the bees go about their quiet lives of desperate food-gathering, and as the plants go about their quiet lives offering food bribes to pollinators, pollination occurs. When pollination occurs and pollinators are effective, all is well with the world. Things are good. We, as interlopers, are not truly part of this grand design. So, is it okay if I suggest that humans are opportunists in this plant/pollinator relationship? Yes, we help everywhere we can, but when all is totaled, it is the plants and their pollinators that are the major players on this biological stage.

Good grief, Jim, what are you trying to say??

I'm trying to say that the nectar flow is intricately related to the pollen flow and that both of these events are the fundamental drivers of generalized pollination. And it is that processes of generalized pollination that fundamentally drives life as we know it and specifically – fundamentally drives *human* life as we know it. It's a huge picture. Too huge.

For instance, when a beekeeper hypothetically asks another beekeeper, *"When does the basswood flow start in your area?"* the conversational emphasis is on (1) a surplus honey crop from basswood trees, and (2) basswood pollination. And honestly, there is very little interest, between these two people, about seed set in basswood trees. In this conversation, the big picture of seasonal nectar flow is crushed down to a manageable, bite size issue, *"When do you get basswood honey?"*

A beekeeper started this . . .

Sometime last year, on my web page, a beginning beekeeper asked me how he could tell when the nectar flow began, and how he could tell when it ended. It was a legitimate question with a clear purpose.

An aside...

At this point, I recalled the comments of good Friend, Lonnie F., when he told me that experienced beekeepers do not always make the best instructors for brand new beekeepers. He elaborated saying that experienced beekeepers too often assumed that the beginner understood more than they actually did and that advanced beekeepers would start too far up the bee knowledge ladder. Too many basic fundamentals were omitted. I am suspecting that Friend Lonnie was correct.

You see, the tyro beekeeper who questioned me only wanted some generalized pointers that were readily – Visible. Measurable. Simple. However, my inclination was to start with, *"Well, the nectar flow actually started 130 million years ago, during the Cretaceous period....."* It is not that I was trying to be a gifted academician, but that I was trying to be to as correct as possible. I was about to overkill my answer, but thanks to my friend's admonishment, I took the basic approach – but then I found that I was left with the greater answer to the smaller question. Now I had questions of my own.

The beloved nectar flow

In a real sense, the generalized search for food starts the instant the wintering colony can break its cluster. Those of us who actually have a restrictive Winter know those special days – those rare, nice, warm, Winter days. The ground is still frozen. Dirty snow is here and there. The wind is still, and the sun is bright, and the bees are stirring. One by one, groggy bees take tenuous flight – and then they defecate. Effectively, they are grooming and

[1]Feeding Protein to Bees. https://www.blog-veto-pharma.com/gb/feeding-bees-what-role-does-protein-play/

preparing themselves to search for food sources. That same warm day is also awakening the flowering plants that have been evolutionarily chosen to bloom early. Interestingly, those pleasant, late winter days mean a lot to bees, plants and beekeepers.

At this point, I should acknowledge beekeepers who live in perpetually warm weather areas. While the bees may not go in distinct periods of forced inactivity, they must prepare for periods when food foraging is scanty. At times, not much is out there. During those times, they need food reserves. In this warm climate, the food flow starts when various plant species begin to offer their pollination rewards.

A typical pollinator on a typical blossom.

The very first food source of the season

At this early time of the new season, there is bee biology overlap. The annual season is in transition and is shifting from Winter to Spring. Increasingly, the bees are active and are searching for food, but precious little is out there. During those transitional times, eager foragers, with little else to do, will seemingly nose around neighboring colonies that are either already dead or are near death. It has been my observation that one of the first food sources bees explore is abandoned resources of other colonies.

Robbing behavior is intermeshed with nectar and pollen foraging behavior

If the weather is warm but food sources are not abundant, then, *"Bees will just rob amongst themselves."* Yep, it's true. The natural honey bee neighborhood is a high crime neighborhood. Colonies robbing each other appears to be a completely legitimate avenue for acquiring surplus food reserves.

Yes, yes, I remember, I had a robbing rant in the April issue of *Bee Culture. So, there's more?* Yes, but this time, my comments relate to the relationship that robbers have with food foragers within the colony. Actually, robbers and foragers are the same bees. Different day – different job.

Effectively, robbing behavior is a status indicator of the intensity of the food flow in the environment. So, if the weather is warm and dry and baby bees are in the brood nest – crying to be fed, the drive for food acquisition will be omnipresent within the colony. Therefore, foragers will leave on food-gathering sorties. These forgers and scouts (specialized foragers) are really good at what they do. Yet, talented though they may be, if they are unable to find any meaningful productive nectar and pollen, foragers become robbers. The demand is there, but the products are not.

The overlap

My monthly disclaimer – what follows is opinion and not science. There has to have been bees that were checking out neighboring colonies all the while – even during productive food flows – peeping *in neighboring hive windows, as it were.* I suggest that notion because I have personally seen foraging shift to robbing behavior in just hours. Did that shift occur because the robbers had just found the neighbor colony's source or was the potential location known all along, when better yields were being offered by flowering plants? One way or the other, foraging bees can quickly change to robber bees. And then, they can just as quickly change back – all depending on incoming information from the field.

The robbing indicator

The beekeeper, standing in their apiary on a spring day, and watching robbing behavior around dead-out equipment, can surmise that, at that moment, very little is coming in from the field. Though Spring seasons are mercurial and change quickly, at that very moment, it may not be the best time to open colonies for managerial checks. Most likely, the bees will be testy and defensive. The *"robbing indicator"* tells the beekeeper when the nectar flow is waxing or waning. But since this is the Spring season and more incoming food is expected, full-blown robbing most likely will ***not*** develop during this time. Robbing activity marks the interstices between segments of the annual flowering season.

Robbing may – or may not – always be lucrative for the bees. In thinly bee populated areas, robbing the neighbors may not be particularly

An example of desperation foraging. Dumpster diving bees.

productive. At times, essentially nothing is out there. There's no food to be gathered and no food to be robbed. If this is the case, things better change and change quickly for the upcoming winter is on the way. In the best of times, bees looting their neighbors is a desperate way to go.

"Desperation Foraging"

I don't have a term or a word that routinely describes what I have called *desperation foraging*. I should probably have labeled the procedure *desperation scrounging*. There is nothing in bloom and there are no neighbors to rob. So, the underemployed bee seemingly just goes cruising. *Got nothing else to do.* During these difficult times, garbage bins are common attractions. Normally, the bees (and flies and yellowjackets) are just nuisances, but I can give specific examples of chewing gum factories, jelly production companies, and powdered sugared drink mix companies that had waste sugar sources that were so significant, that bees could actually store some very strange food reserves from these sources. The populations of bees at those waste areas were significant and disruptive.

Desperate foraging also includes bees visiting such places as bird feeders for corn dust protein or visiting my sweet corn ears that were awaiting going on the grill. I mean *come on!!* Times are so bad out there that licking an ear of sweet corn is the best that can be done.

So, I ask you…

So, I ask you the question that I was asked, *"How can I tell when the nectar flow starts and ends?"* It would appear that food garnering by a honey bee colony – so long as the weather is warm and agreeable – does not end.

A clue that not much is happening with the nectar flow.

There may be brief periods during swarming activities when bees are on the move to a new home site; but even then, whenever possible, bees will take a foraging trip. Also, during the season, there will be good times and bad times, but even in bad times there are *some* sources out there. I mean I have a few dandelions in bloom during hard Winter. They are scroungy, pathetic blossoms, but there they are – peeping through the snow. Not much of a nectar flow at that point, but they're trying.

So, I ask you #2…

Do ***all*** bee foraging activities result is pollinated plant blossoms[2]? No. Bees robbing each other and rummaging around a garbage bin does not result in more apples or vegetables. Not directly anyway. Robbing behavior and desperate foraging obviously does not involve any aspect of pollination. But I feel that it is clear that plant pollination is where the real nectar and pollen action is. Robbing fundamentally depends on pollination rewards and bees that dumpster dive are normally minimalists. These two activities are little more than distractions while the bees bide time awaiting meaningful flowering periods to start back up.

[2]Extrafloral nectaries are a special category in which bee foragers visit plants but not the fruiting structures. Plants structures are visited, but successful blossom pollination is not affected.

If you have made it this far

Jeff, Kim, and I have produced a short nectar flow podcast and I produced a brief video on the nectar flow subject that I have posted at: **https://youtu.be/DhcHROgHkN4** The podcast home page is at: **https://www.honeybeeobscura.com**

Thank you

As always, I thank you for reading.

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

Honey Bee Obscura Podcasts

For a short video on **"The Foraging Season"** and more comments on this month's article, hover your smart device QR app over this code....

https://youtu.be/8ltb0sjOT0I

Don't Forget To Check Your Address Label – It Will Tell You Exactly How Many Issues Of Bee Culture You Have Left – You Don't Want To Miss A Single One!

Pan Fried Bananas –

Shana **Archibald**

Pan Fried Honey Bananas
1 tablespoon honey
1 tablespoon water
1 teaspoon brown sugar
1/4 teaspoon cinnamon
1/2 tablespoon unsalted butter
1 large banana, slightly under-ripened, peeled, cut into 3/4-inch slices

In a small bowl, whisk together the honey, water, brown sugar, and cinnamon. Set aside.

Melt butter in a small pan over medium-high heat. Place banana slices in the pan in a single layer; cook for one to two minutes per side, until a golden crust forms (keep an eye on them and adjust the heat if they brown too quickly.)

Remove pan from heat and pour honey mixture over the banana slices. Allow to cool slightly.

Eat on its own or serve over yogurt, cottage cheese, ice cream, waffles, pancakes etc!

note you can also try this with apples. Just cook the apple slices four to five minutes on each side. BC

CALENDAR

♦INTERNATIONAL♦

2021 Beekeeping Tour To Slovenia September 9-24.

Prices are based on a minimum of 10 people. $3600, $200 deposit due by August 1. Remainder due August 15. Price includes everything with a few exceptions.

For information contact Suzanne Brouillette at **beeslovenia@gmail.com**.

♦COLORADO♦

Spring Bee Camps – will be held by Tina Sebestyen near Durango. The beginner's camp will be held June 11-16, geared towards beekeepers with at least one year experience.

The cost is $500 ($100 deposit). Camping and outdoor facilities available at the site and hotels available in nearby Durango.

For information please visit **https://beequest.buzz** or contact Tina at **bee.longing@protonmail.com**.

♦INDIANA♦

The Beekeepers of Indiana partnering with Purdue will hold its annual **Purdue Field Day** June 26. Hands on sessions for beginners and advanced.

The cost is $30/member and $35/non-member and $20/under 16. Price includes a box lunch, and refreshments.

For information and to pre-register visit **https://indianabeekeeper.com/events/purdue_field_day.**

Michiana Beekeepers Association Summer Meetings will be held June 12 - Jeff Pettis; July 18 - Sam Comfort; August 21 - James Tew.

For information visit **Michianabees.org**.

♦MINNESOTA♦

MN Honey Producers Summer Meeting will be held July 8-9 in Mankato.

Jim Gawenis, Sweetwater Science Labs, is the keynote speaker.

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

♦PENNSYLVANIA♦

Delaware Valley University, Doylestown will hold its Introduction to Beekeeping, July 17, 18, 31 and August 1.

The course will cover honey bee biology and behavior; building an apiary and harvesting honey; apiary equipment and supplies; management practices for each season. The course is taught by Vince Aloyo.

For information or to register visit **http://vincemasterbeekeeper.com/courses/**.

♦SOUTH CAROLINA♦

2021 SC Beekeepers Summer Convention - in person will be held July 22-24 at Triden Technical College, 7000 Ribers Ave., North Charleston.

Speakers include Lori Bataller, Jamie Ellis, Ashley Burns, Ben Powell, Bill Kern, Mark Sweatman.

For information see **ttps://scstatebeekeepers.com**.

♦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**.

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You look down from the bridge and see monster trout stacked up on their spawning beds. The biggest chase off their smaller cousins. When Paul and I arrived, there were six or eight fishermen already on the hot spot, and they were catching. Not wanting to butt in, we moved on. But when we returned that evening, the other anglers had retired for supper, or the bar. As darkness descended, we got into some very large rainbows. Holy cow! Was I in Heaven?

Paul's relentless, so we rattled around in his camper at first light. We didn't bother with breakfast or coffee or a toothbrush. When we got to the river, ours was the only vehicle, and our rainbow hotspot was deserted. But with nearly 150 years of life experience between us, Paul and I no longer sprint to the river. We shuffle.

The mother lode is the 50 yards or so just downstream from the bridge, and by the time Paul climbed down off a steep bank, four young men were already flexing their fly rods – two on each side of the river. There was still plenty of room, but as Paul stepped into the water, the angler closest to him said, "We don't fish this close in Wyoming. Don't you have rivers you can fish in Colorado?"

These locals had spotted our camper and hustled down to the water to stake it out for themselves. "Well howdy, Stranger! Welcome to Wyoming!"

Fishing has this in common with beekeeping: It teaches you a thousand lessons, so pay attention! You look back on an incident like ours and muse that you could have done this or said that, but you didn't. The best you can take from it now is a little wisdom. That's not all bad.

Covid? What Covid? They don't wear masks in rural Wyoming, or rural Colorado, for that matter. Paul and I are both all vaccinated up, but we wore our masks indoors at retail establishments. I can't speak for Paul, but I meant this as a gesture of responsibility and courtesy. At the same time, I try to be respectful of those who don't wear a mask, because I refuse to get sucked in to the culture wars.

Back home in the beeyard, Paul's making colony divisions today. I would so love to help out, not for altruism, but to learn. Years ago when I worked for him I took notes, but he does things a little differently now. Wizened second-generation beekeeper that he is, he's still learning, too.

But my plate's pretty full at the moment. I did get a few things accomplished. Paul and I got in that three-day fishing trip. I just knocked out my book: *A Beekeeper's Life – Tales from the Bottom Board*. It's a collection of mostly older *Bee Culture* columns, dating back to 2002. Putting it together and working with a publisher in England and a layout-and-design editor in Italy presented some time-zone challenges.

Friend and commercial photographer John Kelly provided just the right front cover shot for *A Beekeeper's Life* – a golden leaf-littered lane leading through a sunlit cottonwood glade, into the unknown.

My apricot-and-plum grower e-mailed from Palisade, informing me that I can now (It's early April, as I write) move my bees back home. The blossoms are pollinated. Surely I can get this done before some neighboring orchardist starts spraying over blooming dandelions.

I've got pollination contracts at four locations around Palisade, and with our recent warm days these colonies could be boiling over and crying to be split. I'll go down later today to check. Strong colonies would be good news indeed, because I have Carniolan queens arriving from California on Tuesday. I'd prefer that they arrive a week later, but I already changed my order twice. I have a longstanding relationship with my queen producer, and I don't want to wreck it by acting flakey.

I called the gal Marilyn from Wyoming and had her set up an emergency dental visit for me. A toothache just plain takes the fun out of life. I'll be in the chair at 7:30 a.m. tomorrow, after which Marilyn and I plan to ski. I can drop off honey in Aspen. The Aspen Skiing Company awarded us both lifetime ski passes, in recognition of my 40-plus years on the patrol. We hardly ever go, but I owe her this one. It can be a date.

I was offered a couple of bee locations on Pitkin County open space property. They're 40 miles from home, but I get up that way anyway, to visit my billionaire's bees, so maybe this will work out. I like to do business on a handshake, but now I have to go over the legal paperwork required by the county. I warned that if it gets too complicated, I'm backing out. But Pitkin County (think Aspen) is very green, and they want my bees.

One of these locations already has a bear fence. I'll still need a solar panel, battery and charger from Colorado Parks and Wildlife. Our Colorado bears like honey, but they love bee brood. You don't want to let them develop a craving for it.

So I have plenty to keep boredom from setting in. But my priority list is pretty simple: First the bees. Then fishing. Then all the rest of it.

Ed **Colby**

First The Bees