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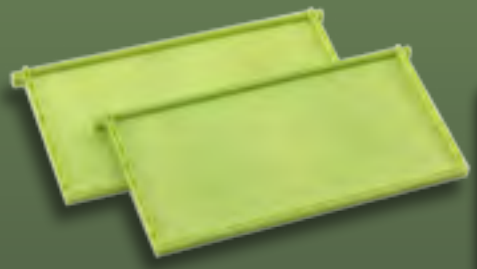

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Top-bar Hive online class. Books – Beekeeping With Children and School Groups; A Practical Handbook on Honey Harvesting and Extracting; 10 Plants To Feed The Bees; What on Earth?.

HISTORY OF THE BRITISH NATIONAL HONEY SHOW 26
It started in 1921 and is still going strong.
Val Rhenius

THE CHALLENGE 35
Developing an environmentally friendly miticide, Part 2.
David VanderDussen, Kathleen Ireland

HONEY BEES, ANTIBIOTICS AND GUT MICROBIA 43
The role of antibiotics is both good and bad in honey bee microbia.
Rebecca Novak Tibbitt

KILLER BEE HONEY 46
African bees make honey from Magic trees.
Abu Bakr Ladd

KEEPING BEES IN THE KINGDOM OF THE WEST 47
Morocco's beekeeping is similar to our's, but their culture is so different.
Melanie Kirby

HERBS & VEGGIES & FLOWERS, OH MY! 53
Some for you, some for the bees.
Janet Davis

HISTORY OF THE MUTH BOTTLE, PART 1 65
A history of the first jar invented specifically for honey, and the man who came up with the idea.
Jim Thompson

CONVERTING CUSTOMERS TO CREMED OR GRANULATED HONEY 71
Make more money, work less.
Howard Scott

ZIKA AND BEE KILLS 91
Honey bees are collateral damage in the war on Zika.
Tom Rearick

BACKYARDS AND BEES 96
A plethora of pollinators exist on two+ acres.
Eugene Makovec

800.289.7668
Executive Publisher – John Root
Associate Publisher, Senior Editor – Kim Flottum, Kim@BeeCulture.com, Ext. 3214
Assistant Editor, Design – Kathy Summers, Kathy@BeeCulture.com, Ext. 3215
Social Media, Event Specialist & Subscription Coordinator – Amanda DeSimone, Amanda@BeeCulture.com, Ext. 3255
Advertising – Jean Newcombe, JNewcombe@BeeCulture.com, Ext. 3216
Publications Assistant – Kaitlin Newcombe, Katie@BeeCulture.com

Contributors
Clarence Collison • James E. Tew • Ann Harman • Kim Lehman • Phil Craft • Larry Connor
Connie Krochmal • Jessica Louque • Toni Burnham • Ross Conrad • Jennifer Berry • Ed Colby

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Beautiful herb garden photo by Janet Davis.

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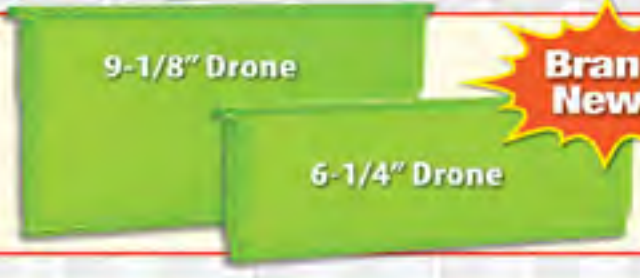

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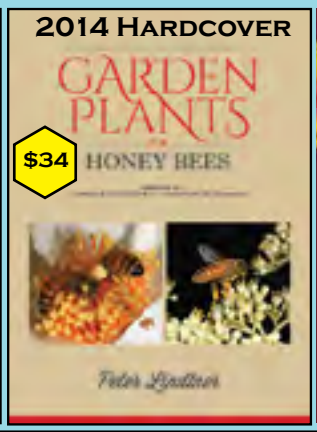

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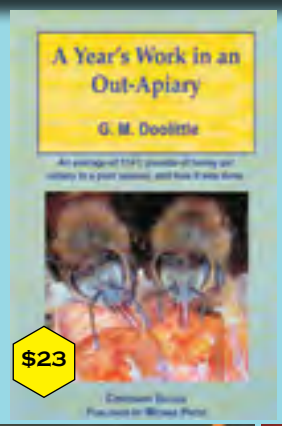

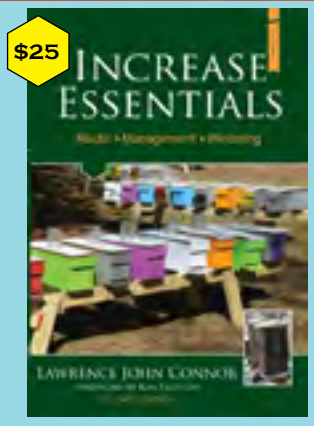

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WAS 40th anniversary conference comes home to UC-Davis in September!

Join the Western Apicultural Society (WAS) for their 40th Annual Conference this September 5 - 8, back where it all began at the University of California, Davis. Enjoy the northern California sunshine, on-campus bee garden and all the 'bee culture' places, events and people that have been drawn to the Davis area over the years. Mix and mingle at the Bee Buzz Social the evening before the conference begins, hear excellent speakers talk about the latest science has to offer the beekeeping industry, with plenty of time to visit with other beekeepers from all over North America.

For those not familiar with us, WAS is a registered non-profit, educational organization with specific interests in western North America (though we have members from all over). Created in 1977 to address the then-unmet needs of small-scale beekeepers, the 2017 version of WAS continues to take care of those needs at the same time it acknowledges and remains inclusive of the commercials. New research, which is the basis of the conference and, by extension, the WAS Journal, is not exclusive to either end of the spectrum. Nor do you need to be a WAS member to join us at the conference.

President Dr. Eric Mussen is a retired entomologist from UC-Davis and still the top 'go-to bee guy' in North America. He is organizing the conference to take advantage of the great resources offered on-campus. Other Davis entomologists - Drs. Elina Niño, Brian Johnson, Rachel Vannette, Neal Williams and Robbin Thorp - are expected to be speaking on their specialties, which include molecular studies, varroa control products, pesticide issues, and work on the succession of microbial turnover in flower nectars as the bloom period progresses. Dr. Thorp, now retired also, specializes in native bees, especially bumblebees. Serge Labesque, a Glen Ellen CA beekeeper originally from France, is "cemented in" as the lead-off speaker. Serge espouses selecting local stock to keep his bee colonies strong and is widely recognized for his immaculate beekeeping and his extraordinary teaching skills. Though they don't agree on all details, Serge and Eric are good friends and each respects the other's expertise.

Conference week will include tours to a major beekeeping supply outlet and a local, specialty-honey packing operation - and look for some special events marking the 40th anniversary. Dr. Mussen was the first WAS vice president way-back-when and the first president, Dr. Norm Gary, a well-known Davis "character", will also be participating. Expect some fun!

Watch the website (www.westernapiculturalsociety.org) for more details as they become available.

Bee on California poppy - California's state flower. Photo by Kathy Keatley Garvey

Bee Culture's Best . . .

THE VOICES OF *BEE CULTURE* 2
Join us in Medina in September and hear from our *Bee Culture* authors that write for us each month.
Bee Culture Staff

FOUND IN TRANSLATION 28
Minerals and the bees' needs.
Jay Evans

A CLOSER LOOK – TROPHALLAXIS 29
Trophallactic interactions can frequently be seen non-randomly between all members of the colony.
Clarence Collison

BEEYARD THOUGHTS – OBSERVATIONS AND UPDATES 59
Robbing, swarming, hot bees and thick honey.
James E. Tew

ON HONEY BEES AND FUNGI 75
The relationship is a complicated one.
Ross Conrad

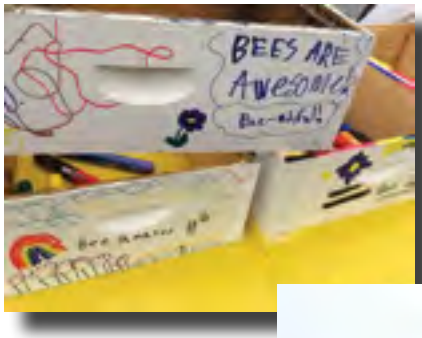
BEE KIDS' CORNER 80
All the buzz – for kids.
Kim Lehman

BIGGER PICTURE – HONEY DAZE 83
Get others involved in your honey processing.
Jessica Louque

IN SEARCH OF THE BETTER ~~MOUSETRAP~~ BEEHIVE 86
What are honey bees looking for when they're looking for a new home.
Ann Harman

DOWNTOWN – KEEPING BEES WHERE THE POOP HITS THE FAN 99
And a bunch of other machinery, too.
Toni Burnham

BOTTOM BOARD 104
Liquid Nitrogen ice cream.
Ed Colby



Page 99

Page 71

In Every Month –

Honeycomb Hannah 9
What's going on in the hive?
Mailbox 11
Honey Market Report 20
What's important in selling honey.
The Inner Cover 22
Natural gardening.
It's Summers Time! 25
Chickens, mowing, just being outside.
Calendar 102

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More On African Bees

Here in southern CA, we've had Africanized bees for almost 20 years. So we can assume that most feral bees are Africanized. But there are a large number of beekeepers who are keeping feral bees without problems. The bees are more defensive than pure European but not really difficult to work with.

They are good honey producers and do not swarm excessively or abscond. I only have a couple of hives of feral bees but I am friends with two commercial beekeepers who each have over 100 hives of feral bees and they report the same experience. The commercial beekeepers keep feral bees because they are much lower maintenance.

After hearing how Africanized bees are so defensive, and how their genes dominate once they enter an area, I am puzzled by what we're seeing in Southern CA. I have a theory but I'm not an expert.

My theory is that there are evolutionary pressures on bees in an urban setting such as Southern CA. Around here, feral bees usually do not remain long in a non-managed setting (maybe a year or two). If they set up housekeeping in someone's home or on their property (remember, property is small in SoCal), once they are discovered the homeowner will call either a bee rescue or exterminator. If the bees are determined to be "aggressive" (really, excessively defensive) they are exterminated by both groups.

Then, some managed backyard bees are European stock so we have the continual introduction of European genes into the wild mated queens.

Perhaps we are producing a less defensive Africanized bee here in Southern CA by the actions of beekeepers and exterminators. One that can survive treatment free and is not excessively defensive. After all, the European bee was produced by beekeepers selecting for less defensive traits.

And the African bee was made extremely defensive by the way wild hives are harvested for their honey and beeswax in Africa (only the baddest, most defensive bees survived).

Mike Henderson
Southern CA

Kids' corner

In South Carolina, Clemson University has recently added Beekeeping to its 4-H program. This is the first year and has over 70 kids participating. We all know how important it is to get youth involved. Someone has to take up the Smoker as we older folks put ours down. Each child was encouraged to find a mentor. They essentially "Foster" a hive and experience everything the Mentor feels the child would benefit from. Attracting children to beekeeping can be tricky. I have a nine year old girl named Charlotte. She is smart and very creative though still nervous around an open hive. What student isn't? I have used your *Bee Culture Kids Corner* for ideas to engage her. Beekeeping has so many facets. Building and painting wooden ware, cleaning wax, cranking the extractor and our most recent project making Honey Straws! Thank you for helping me and other mentors, parents, and grandparents help our youth to learn to enjoy the many facets of Beekeeping.

Susan Suber
Mountbille, SC

Winter Loss In NH

New Hampshire beekeepers lost 65% of their bees last Winter. I had five hives. I lost all five. Two were here at home, two in my beeyard six miles away and the fifth at my sister's 35 miles from here.

Bee Culture
623 West Liberty St.
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All had honey from top to bottom. Bees were clustered together.

Last Summer NH had a near record lack of rain. Would the pollen and nectar be of such poor quality that the "Winter" bees lacked the "fat" in their bodies and quality in their Winter stores they couldn't survive the Winter?

Richard Brewster
Andover, NH

***Editor's Response**: All manner of things may have contributed to this. Too cold, too long. Not enough pollen or poor quality pollen due to dry Summer. Queenlessness, mites, virus(es) . . . the list goes on. And questions – What was mite load in July? In September? Without more information I'm guessing. Anybody else?*

Queen Rescue & SHB

I call my successful Winter Queen rescue system "Saving A Good Queen With A 40-Watt Bulb." Inspecting my surviving hives on a mild early January day (December had been quite mild) I found one hive with a tiny cluster of about 20 bees and their queen. I knew they would not survive the next cold snap. I took a shop light with a 60-watt bulb and put it over an inner cover in an empty deep and left on continually. Adjacent I installed a remote temperature monitor (in case bulb burned out!). They survived 10°F night temperatures and on mild days I switched inner covers with a populous hive and adhering bees to build them up. By early February it appeared the 60-watt bulb was generating too much

heat and I put on a 40-watt bulb till mid April. The hive by then was populous with drifting bees from recently installed packages and queen was laying. Now June 7 hive is filling a second super!

Also an update on my "Fitz Rfugia" (sample enclosed) hive beetle monitoring and control device which you hi-lited several years ago in *Bee Culture* in the Mailbox section. I have fine tuned this device to the point where bees can no longer enter and do not generally propolize but leave open. This was achieved by installing plastic drinking straws in corrugated slots to reduce size preventing most bees from entering and providing a safe refuge for beetles. It also appears once beetles colonize refugia they leave an odor or pheromone attracting other beetles. This enables the refugia to be left on year round. They are placed two per hive in rear of top super straddling frames and during Winter over cluster.

Use is simple. Upon opening hive remove refugia and tap with hive tool over open surface (hive top or inner cover). This dislodges beetles where they can be joyously crushed. I was able to eliminate all beetles from over wintering hives and remarkably have not found any in four installed packages of Russian hybrids. My hope is one of supplier companies will see the merit of refugia and replicate and offer to their customers.

Joe Firzpatrick
Blue Bell, PA

Kudos To Charles Lindner

Just wanted send my best to *Bee Culture* Magazine and Charles Linder for the article in the July 17 issue. Bees & Pesticides & Facts. I crop farm on the side with several hundred Acres of Beans and only added bees to the farm a few years ago as a point of interest and to enhance some other crops.

I appreciated Charles reference to farmers actually using "common sense" in the use of pesticides and crop genetics. Seeing both sides of crop production and bee management there is common ground and the perceived rub between farmers and Bee keepers is overstated in most cases.

Keep up the good work with the magazine!!

Jeff Patulski
Freesoil, MI

Pesticides Are A Problem

I am not sure how Charles Linder would explain how beekeepers (or anyone) should "look at the EPA as our friends" when on March 29, 2017, the agency announced it will NOT BAN chlorpyrifos – a dangerous neurotoxic pesticide widely used in agriculture and linked to many health hazards, particularly damage to children's brains. Chlorpyrifos is an organophosphate insecticide that is sprayed on a variety of crops including apples, oranges, strawberries, (aren't these pollinated by pollinators?) and other foods that are widely consumed by children. I have not seen any data on cloropyrifos and pollinator populations – but it can't be good.

Linder asks us NOT to be political, but the EPA, chemical industry lobbyists, and the current "get rid of regulations" administration makes this impossible. Beekeepers NEED to be activists and need to be political. And they also need to question the science the EPA is using and the science coming out of chemical industry studies. These companies need to be held accountable for the seed and chemical products they put in the market place where they are coated on seed, sprayed on plants, ingested by animals, fogged on insects and injected into millions of acres of soil each season. This continues to happen on a worldwide scale. And it's not good. It's not sustainable. No part of synthetic pesticides are healthy. Harmful levels of synthetic pesticides are in our food supply, in our water supply, in the air we breathe.

I am a beekeeper in Minnesota running 15-20 colonies per Summer. For the past 40 years I have owned and operated a farm seed business with 30 full time employees. Albert Lea Seed produces USDA Organic Farm Seed, conventional farm seed (both treated and untreated) pedigreed small grains, alfalfa, clover, annual and perennial forages, native grasses, turf seed products and runs an all season garden center. We distribute GMO Corn and Soybeans for another company. After 20 years of being a licensee

with these companies we let our licenses lapse. We see the future, and it is in Non-GMO and Organic Farm seed.

Reading Mr. Linder's article you would think "it's all good" and getting better. In my opinion, that is not the case. Like him I feel I have a very clear picture of what's happening in U.S. agriculture especially when it comes to seeds, seed treatments, insecticides, herbicides, nematicides, fungicides, fumigants, which all can be applied as either preplant, pre-emerge or post emerge treatments throughout the season. Chemical use in world agriculture continues to increase in lbs of active ingredient applied per acre. This is most true with herbicides. GMO's promised LESS herbicide usage, but weed resistance now has increased the use of herbicides.

The one bright spot in GMO's was less insecticides being used in genetically modified, insect-protected corn which has allowed farmers to reduce their use to fight the corn root worm and the European corn borer. However, increasing insect resistance is the obvious current wrinkle in the promise of these GMO's. Let's guess – more bug spray will be the solution?

According to Cornell entomologist David Pimentel "[i] t has been estimated that only 0.1% of applied pesticides reach the target pests, leaving the bulk of the pesticides (99.9%) to impact the environment." The promise of systemic seed treatments and GMO's targeting individual insects is that farmers will use LESS spray because the insects die after eating the plant and synthetic pesticides don't have to be used.

The reality of GMO corn, soybeans, cotton, canola and other GMO crops is that native pollinators and honey bees continue to be exposed to pesticides as the efficacy of these technologies fade. Anyone living in the midwest is in the middle of the fading GMO efficacy. I have attended crop field days the past five years where the main university or industry speakers standing in giant green fields of corn encourage farmers to include "in furrow" applications of insecticides – while still using insect resistant GMO seed products! What is wrong with this picture? The idea that neonics and GMO's should continue to be embraced by agricultural because they work is frankly troubling at best.

I agree with him that these technologies are not going to disappear, but our approaches must change. Organic agriculture is now producing 200 bu corn yields on a regular basis, 60 bushel soybean yields, 150 bu oats yields without ANY chemicals being used. The organic crop rotation protocol including cover crops is increasing (in some cases) organic matter in the soil by 1/2 % per year and more. Beneficial insects are returning, water quality is being improved, soil biota is being brought back to life and on organic farms farmers are healthier for not handling syntheic pesticides. This is the direction US agriculture should be going, and beekeepers should lead the charge.

Tom Ehrhardt
Albert Lea, MN

The Bailey Comb Exchange

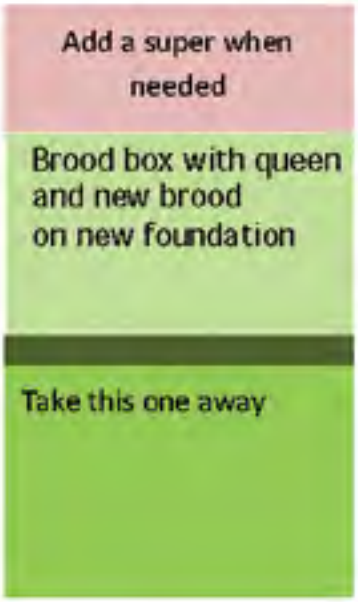
One of the five management techniques Ross Conrad describes (*Bee Culture*, June 2017) is rotating old comb out of the hive, and it would appear that he uses a five year rotation. After talking to a number of beekeepers in Slovenia last year I am moving to a two to three year rotation in the brood chamber. Not changing brood comb frequently is akin to keeping the same filters in the air conditioner in the nursery and wondering why one's children grow up with lung and breathing impediments.

Clare Densley at Buckfast Abbey provided the means to do it. Called The Bailey Comb Exchange, it is both simple and effective, and the essence is to replace a box at a time rather than individual frames.

1. In the early Spring reverse the boxes so that the queen and the brood are in the bottom box.
2. Add a box with new foundation above this brood box.
3. Unless there is a strong nectar flow in progress, feed with a 1:1 syrup solution, stimulating the worker bees to draw out comb on the new foundation.
4. After two to three weeks, when the bees have drawn out some of the foundation, move the queen on to the new comb.
5. Put a queen excluder over the old brood chamber, thus trapping the queen in the upper chamber. Nurse bees will move up to tend the new-laid eggs and larvae.
6. After three weeks, when all of the old brood had emerged, remove the old brood chamber. The decision can be made as to whether to keep any of the individual frames. I am trying to be more ruthless in discarding old foundation, using most of it for bait hives.

One question is whether changing a box of foundation at a time affects the honey production. Logic would say yes although for me it is early days and the jury is still out. I used the Bailey Comb Exchange in all of my Langstroth hives this Spring, as well as my A-J Honey House, and the honey harvest promises to be significant, but we also had a good and lengthy nectar flow this year. Perhaps the combination of new wax and healthy brood compensates for the energy (ie. raw nectar) that the bees use in drawing out the new frames of foundation and which is lost to the beekeeper in the form of capped honey.

Jeremy Barnes
York County, PA



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New This Month –

Beekeeping with Children and School Groups. By Undine Westphal. Published by Undine Westphal. 143 pages. www.beesfordevelopment.org. 6" x 8 ½ ", color, hard cover. £23.00.

Thinking of starting a beekeeping club at an elementary school? Undine Westphal shares strategies and ideas from her experiences teaching beekeeping to school children in Hamburg, Germany for over seven years. This is not a comprehensive book about how to keep bees but a guide in ways to structure beekeeping sessions with groups of school aged children.

Working with a group of children can be challenging. Add beekeeping to the mix and the need for extensive planning and preparation increases enormously. This book offers suggestions on establishing ground rules, creating smaller groups, and assigning duties to create successful experiences for all. As you would expect, one chapter is devoted to safety issues. Beekeeping does involve fire, potential allergic reactions, and sharp objects. Highlighted side bars throughout the book also offer precautions and things to be aware for the projects in the apiary.

Each of the 23 beekeeping activities includes a list of required materials and a description of the activity, along with classroom management ideas for varied age levels. Beginning with preparing children for their first hive experience, the author continues with early Spring manipulation, adding a super, swarms, making nucleus colonies, queen rearing, Winter feeding, and more. Tasks involving honey extraction incorporate honey care, bottling, labels and selling honey.

The last section of the book includes 20 craft and game ideas specifically geared for children. For instance, one project involves making a game to match pictures of beekeeping tools with their corresponding vocabulary word. Another inspires children to create a mini pasture puppet theater using a paper plate.

The directions for the crafts and games are in paragraph form. Even though I find numbered steps easier to comprehend and follow, many of the activities are fresh and would be fun for children.

If you are an experienced beekeeper interested in setting up a beekeeping club at a school, with a 4-H unit, or home school group, this book offers great suggestions to get you started and keep you going for an entire year.

Kim Lehman
BC's Kids' Corner Author

Top bar hive beekeepers – The derth is over!

Simple and easy to manage, top bar hives have been gaining traction in the U.S. as more and more people become aware of the plight of the honey bee. A top bar hive supports the bees' natural systems inside their hive, as well as making life easier for the beekeeper – since there's no heavy lifting involved. But learning about this natural beekeeping method has been difficult – until now.

This professionally produced online class will help beekeepers, both new and experienced, learn the management techniques that work best in a beehive where "It's All About the Wax!" The class was produced with assistance from a grant from the Eva Crane Trust. Dr. Eva Crane, "without doubt – one of the greatest writers on bees and beekeeping in the 20th century, formed the Eva Crane Trust with the aim of advancing the understanding of bees and beekeeping by the collection, collation and dissemination of science and research worldwide as well as to record and propagate a further understanding of beekeeping practices through historical and contemporary discoveries."

Taught by Christy Hemenway, herself the author of two books on the subject of top bar beekeeping, the class supports natural beekeepers with practical, real-life methods and richly detailed information on the "why" of top bar hive management. Hemenway's dedication to teaching the underlying reasons for bee management is evident in both her books: *The Thinking Beekeeper - A Guide to Natural Beekeeping in Top Bar Hives* and its sequel *Advanced Top Bar Beekeeping - Next Steps for the Thinking Beekeeper*.

Visit the Gold Star Honeybees website to get started right. There you'll find information and support, along with all the tools you need to keep bees naturally in top bar hives – including bees! To connect with other top bar hive beekeepers – visit our Top Bar Hive Beekeepers group on Facebook!

New Reading –

Bill Winner, Capilano Beekeeper Services Manager and Doug Somerville, DPI Technical Specialist Honey Bees, co-authors of the new Honey harvesting and extracting guide.

A Practical Handbook on honey harvesting and extracting. By Bill Winner and Doug Somerville. Published by Tocal College, New South Wales, Australia. 8.25" x 11.5", 122 pages, color throughout. Soft cover. Hardcopy $30A, plus post. Digital version available.

Honey Harvesting and Extracting is from Australia, but it might as well have been written in Iowa. It's primary audience is for the commercial market, but backyard beekeepers will learn much from this as it is a multitude of things that can go wrong when moving honey from hive to honey house to uncapper to extractor to storage to market. Plus, much of what our soon-to-be food safety regulations will become are already standard and we do have much to learn to catch up to the rest of the world.

"This practical guide will assist beekeepers whether they are small-scale recreational or commercial operators," Dr Somerville said.

"It has important information on the best way to handle honey, including food quality, food safety and compliance with basically international legislation and regulatory principles are covered in the guide.

Dr Somerville said the guide outlines the best principles for the design, construction and cleanliness of a honey house, and there is also a section on mobile extracting plants, as many of the requirements for central extracting plants also apply to mobile plants.

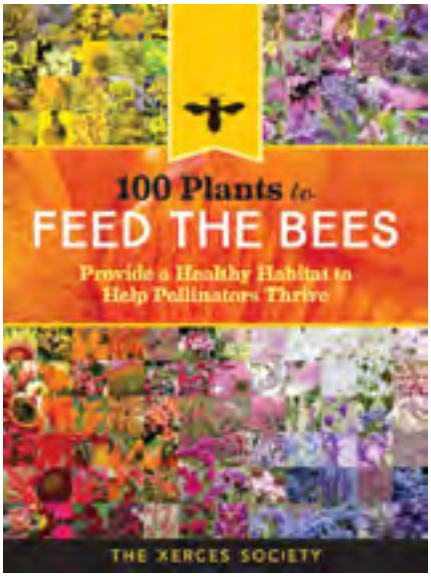
I've not found an up-to-date resource like this, and with new laws coming into effect, US beekeepers can use every resource they can find.

The Honey harvesting and extracting AgGuide is available in hard copy, online from http://www.shop.nsw.gov.au/pubdetails.jsp?externalCode=B966 or mail order from Tocal College or as an ebook through iTunes and Google Play.

Kim Flottum

What On Earth? Bees. by Dr. Andrea Quigley. Published by QEB Publishing. ISBN: 9781682971499. Hardback, 64 Pages color throughout. 9.4 in x 7.3 in. $12.95

Discover all you and a child need to know about bees and their place in our world through experiments, investigations, and hands-on tasks.This book takes a cross-disciplinary approach, including links to culture, history, arts and crafts, as well as the science behind the topic, encouraging children to engage with the natural world through exploration, creativity, and investigation. Sections include Busy bees, Bee senses, Meet the bees and Saving Bees. Fun facts abound, and each topic in each section is beautifully illustrated. There's lots of stuff to make, to do and to read. I'm not a children's book reviewer, like Kim Lehman (who should have done this instead of me) but this is an amazing book. – *Kim Flottum*



100 Plants To Feed The Bees. By The Xerces Society. Published by Storey Publishing. ISBN 978-1-61212-701-9. 6" x 8", 240 pgs., color throughout, softcover (hardcover and ebook available). $16.95.

This well written, useful and extremely attractive, user-friendly field guide shows what you can do to feed pollinators. The Xerces Society for Invertebrate Conservation offers browsable profiles of 100 common flowers, herbs, shrubs, and trees that support bees, butterflies, moths, and hummingbirds. The recommendations are simple: pick the right plants for pollinators, protect them from pesticides, and provide abundant blooms throughout the growing season by mixing perennials with herbs and annuals! Each flower has excellent photos, info on where it grows in the U.S., what to plant it with, when it blooms, best growing requirements, uses, height, color, more. – *Kim Flottum*

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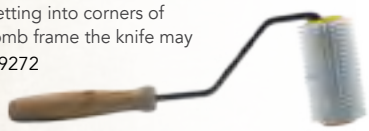

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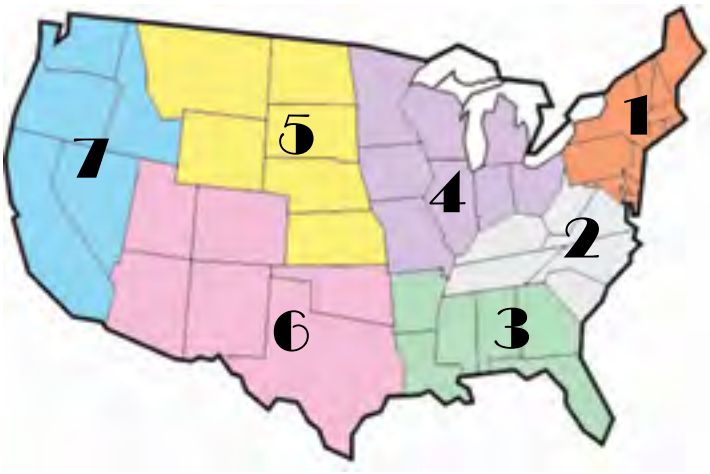
AUGUST – REGIONAL HONEY PRICE REPORT



	% Important						% Less Important					
	2012	2013	2014	2015	2016	2017	2012	2013	2014	2015	2016	2017
Price	80	59	53	55	59	66	20	41	47	45	41	34
Label Design	64	46	49	35	38	45	36	54	51	65	62	55
Name on Label	71	67	64	60	71	71	29	33	36	40	29	29
Local Honey on Label	96	61	77	66	61	55	4	39	23	34	34	45
Variety of Honey/label	27	32	19	24	23	25	62	78	81	76	77	75
Second Label	17	5	8	9	14	18	83	95	92	91	86	82
Location I sell	61	57	58	54	58	66	39	43	42	46	42	34
Time of Year	36	17	28	17	23	29	64	83	72	84	77	71
Glass Container	52	35	31	36	35	40	48	65	69	64	65	60
Plastic Container	25	19	17	19	14	16	75	81	83	81	86	84
12 oz. size	55	32	35	32	38	38	45	68	65	68	62	62
1 lb. size	74	56	60	55	48	56	26	44	40	45	52	44
2 lb. size	65	35	55	37	35	42	35	65	45	63	65	58
5 lb. size	43	38	42	36	23	27	57	62	58	64	77	73
Quart jar	57	46	45	44	45	44	43	54	55	56	55	56
Pint Jar	52	42	40	36	41	36	48	58	60	64	59	64
Specialty Jar	30	10	13	13	11	10	70	90	87	87	89	90
Gallon	-	-	-	24	15	11	-	-	-	76	85	89
Raw	-	-	-	67	67	64	-	-	-	40	33	36
Color	-	-	-	27	41	26	-	-	-	73	59	74
Other Products	-	-	-	-	2	8	-	-	-	-	98	92

We surveyed our reporters again this month to find out what principles and what items were important to their honey sales strategies. Price is always important, but that focus changes occasionally. A couple of years ago it was most important to almost 60% or our reporters, dropped to almost half, then slowly rose again to this year's 66%. We suspect it has to do with pressure from inexpensive foreign competition keeping prices lower than we would like. Having your name on the label is mandatory almost everywhere, and is becoming even more important in marketing plans and food safety regulations. We suspect it has to do with identifying a local honey, the two subjects being no. 1 and no. 3 for most important this year. And being local is important, but seems to be slowly dropping as this is the lowest it's been since we started. Other label information is important, such as what variety the honey is (wild flower most common, unfortunately), is a second label used for, say variety, or feeding to children, or how to liquefy is rising, and having a Raw label, somewhere, is always a good thing to do, as long as it is raw, OK?

One pound, quarts and 12 oz. still dominate for containers, while specialty jars lag far behind. Glass is still popular, but not dominant anymore. We weren't surprised at the low popularity of the gallon container as it continues to drop. To get your money's worth it should cost over $100, which few civilians are willing to pay upfront. $10 for a pound is steep enough for many. Where honey is being sold seems important as it is the most important marketing item for two thirds of our reporters. Work, home, farmers markets, grocery stores…these are explored in another survey we do in the March issue each year. Last year's top locations were home of course, but followed by seasonal and year round farm markets, organic and health food stores and local mom and pop stores. Well, that's where most folks sell, but the most honey, by far, goes to small, medium and large packers, who use it for their outlets. We also asked again this year if having additional items to sell was important and remain surprised at how little influence this had.

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	1.88	2.06	2.28	2.11	2.22	2.08	2.80	1.50-3.00	2.18	2.18	2.30	2.17
55 Gal. Drum, Ambr	1.80	2.01	2.11	2.23	2.13	1.81	2.80	1.35-3.00	2.09	2.09	2.22	2.08
60# Light (retail)	214.38	183.00	197.00	182.55	208.59	192.93	246.67	131.71-300.00	201.32	3.36	206.52	208.34
60# Amber (retail)	223.13	182.25	190.00	182.55	206.90	187.39	245.00	125.71-300.00	200.94	3.35	201.29	204.07
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	91.67	75.20	95.88	65.46	94.71	86.40	144.00	55.92-144.00	89.45	7.45	88.92	79.06
1# 24/case	126.61	106.55	121.42	100.13	148.00	126.12	175.47	86.40-230.00	123.67	5.15	124.54	117.58
2# 12/case	113.11	92.67	107.89	91.72	119.23	101.60	147.00	78.00-182.40	108.25	4.51	109.02	104.40
12.oz. Plas. 24/cs	104.08	87.70	91.00	92.10	114.35	104.40	126.60	66.00-192.00	99.70	5.54	100.10	95.91
5# 6/case	135.69	107.50	114.91	102.29	126.33	121.00	180.00	52.95-206.00	123.18	4.11	127.59	115.92
Quarts 12/case	190.53	132.01	122.58	148.28	185.00	144.12	186.00	85.00-290.00	148.87	4.14	150.02	142.72
Pints 12/case	112.43	87.83	73.50	71.69	111.00	76.32	102.00	65.00-148.00	88.05	4.89	93.52	91.05
RETAIL SHELF PRICES												
1/2#	5.47	4.03	4.87	4.82	5.06	4.50	8.00	2.99-8.00	5.00	9.99	4.66	4.20
12 oz. Plastic	6.27	4.66	5.53	4.89	5.07	6.65	6.74	3.79-9.50	5.73	7.64	5.59	5.67
1# Glass/Plastic	7.61	6.68	7.51	6.28	6.15	6.66	9.40	3.00-12.00	7.28	7.28	7.15	7.11
2# Glass/Plastic	13.58	10.19	12.34	10.16	8.80	10.50	16.13	6.00-20.00	12.24	6.12	12.25	12.02
Pint	13.09	9.72	9.88	8.47	8.10	10.12	10.45	4.00-16.00	9.99	6.66	10.02	9.91
Quart	19.49	15.59	16.56	13.44	15.10	17.72	20.64	8.00-31.00	17.07	5.69	16.95	16.48
5# Glass/Plastic	28.10	24.08	33.24	17.42	20.99	23.54	35.00	7.25-42.00	26.39	5.28	26.04	26.71
1# Cream	10.11	8.46	9.13	8.20	11.23	5.40	11.50	5.29-16.00	9.49	9.49	8.82	8.25
1# Cut Comb	13.35	9.06	8.25	10.65	10.00	6.50	17.00	6.00-23.00	11.28	11.28	10.62	10.61
Ross Round	9.93	6.88	9.92	13.38	9.92	8.17	8.40	5.00-15.75	9.47	12.62	8.57	8.10
Wholesale Wax (Lt)	7.47	5.10	4.58	5.00	6.50	4.69	7.56	2.10-12.00	5.94	-	6.17	6.31
Wholesale Wax (Dk)	7.15	4.75	3.71	5.00	6.25	2.75	6.75	2.00-12.00	5.51	-	5.38	5.61
Pollination Fee/Col.	101.25	75.00	57.50	76.67	80.00	132.50	123.75	40.00-200.00	92.04	-	94.13	81.60

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INNER COVER

We have a garden every year. I know a lot of people that have bees have gardens. They sort of go hand in hand. You have a garden and it needs bees. It's pretty simple. I think we've only missed a couple of years of not having something in the backyard since I started here. A couple of times the weather and travel got in the way and by the time we had the time it was August and too late. It was threatening to do that again this year, but we got a couple of breaks, and we got some extra help so it worked out. Better a little late than not at all.

I always plant some things in the garden just for the bees – odds and ends of flower seeds left over, some extra veggies they particularly like, and I try to let some things go past due for harvesting and go to seed – just so they have something else later in the Summer. Our garden isn't a critical necessity when it comes to putting food on the table, but it supplies exactly what we like to eat. The exact color, flavor and size tomato, all kinds of green, yellow, red, purple and orange peppers, radishes as big, or small as you want, peas and all kinds of beans at exactly the right time and Summer squash as small, or as large as we want. We don't get stale, old, tough or rotten out of our garden. What we harvest is always A+. That to me is the joy of having a garden. I choose what to grow and what to eat, not some produce manager or even a local CSA seller putting it out there and take it or leave it 'cause I don't much care.

We do lots and lots of not too many things. Lots of tomato plants (over 55 this year), and lots of tomato varieties (13 or 14 if I recall), same with peppers and Summer squash and cukes and beans and greens. And we do a whole bunch of really, really hot peppers, in pots on the deck. I don't eat those. Not one, ever. Food shouldn't hurt in my opinion. But we have a lot of friends that can't get enough of them, can't grow them and don't get to farm markets much, and grocery stores here in northeast Ohio don't carry many kinds. So because we always have a lot of them to share we have as many pepper friends as we do honey friends, if you know what I mean.

And with a garden, you can be planting every couple of weeks so there's always something exactly ready right when you want it. We do that with Summer squash, greens, and a dozen or so kinds of lettuce and other salad greens. I get to get my hands dirty every day if I want, harvesting, planting, replanting, harvesting again – it's what a garden is for, right? And especially with the greens and the lettuce, if we don't get to them at the right time and they go past due, there's 20 some chickens who watch us every time we go to the garden because they know when we come back – something will come with us that's a treat and a half they don't get in the Winter.

And there's the herbs. For now, and for this Winter. Basils of all makes and manners, cilantros, oreganos and turmeric and more. Some picked fresh for now, but most harvested and saved for flavoring soups and such. Blended together with some garlic, no, lots of garlic, mixes of basil and parsley, oregano and cilantro, onions and basil and garlic and olive oil – blended to a course mix and frozen for later. We have fresh garden eating 365 days a year if we want.

So in early July this year, the week of the 4th to be exact, I'm in the garden, having just finished the last row for a while and I'm looking at our handiwork. We use 6' x 4' cattle fence panels to hold up the beans and peas and the rest are all in their own rows. Between rows we laid cardboard snug to the plants to keep weeds away, and on top of it all straw to both hold down the cardboard and to add yet more organic to the soil this fall when all the plants get pulled and the rest rototilled under to set for the Winter. All the pepper transplants are put in a furrow opened with the rototiller, carefully set up straight at the right depth and then the furrow filled with a mix of garden soil and potting mix. Tomatoes and herb transplants get their own hole half filled with potting mix and finished with garden soil.Then the whole gets a good soaking, at least a half inch a week from rain or the sprinkler for the first month, along with half strength fertilizer once a week for that month. We give the plants everything they need to do as well as they can. They are nursed, babied, catered to, cared for and tended. And, almost always, they thrive because of that care and feeding. Unstressed plants fend off pests a tad better than their troubled neighbors, they produce more and larger fruit, they start producing earlier and continue longer, and they will harbor more beneficial insects than the same plant with issues of diseases, pests, nutrition or other problems.

So while there, a beekeeper outstanding in his garden, one of those flashes of inspiration came to me. The garden was just starting out. The plants we put in needed everything – seeds needed covered and watered, transplants needed roots buried just so and lots of water, the soil needed covering and protection from eroding drenchings of water from rain or sprinkler. What they didn't need was to be left on their own, seeds scattered about hither and yon, transplants tossed into

Natural Gardening.

the rows, no covering to protect the soil and keep weeds in check and a faint hope it might rain in a day or less before everything dried up and blew away. What they didn't need was to be on their own, by themselves, unprotected, unfed, un-anything. Moved from safe and dry seed package or a greenhouse environment to a cold, dry, nutritionless, cruel world to fend for themselves.

Because that is, you know, what nature provides. Plants grow, flowers appear, pollination happens or not, seeds grow and fall to the ground or are eaten by some seed eating pest or they fall where seeds won't grow, but maybe, just maybe a plant emerges from a seed that makes it. Maybe. Sometimes. And you need a million seeds to get just a few to grow enough to repeat the process. And then they have to live well enough and long enough to produce flowers, produce seeds and do it again. With luck it happens. Do that with a tomato plant and you are a natural gardener. Nothing artificial, nothing added, nothing favored – it's a live and let die tomato you'll get. And if it lives to set fruit, that tomato will be – what – a hybrid of tomatoes of yesteryear, aided by a bumblebee's buzz, sporting the best traits of one or several varieties? Or maybe a self-pollinated same variety as it's now gone parent?

And wouldn't you know there were a few of them growing early this Spring. Self-seeded from last year. Winter didn't kill them (but then, it was a pretty easy Winter), come Spring the seeds from fallen fruit germinated and were already going strong by the time we got transplants ready and could get into the garden without a boat. Yup, going strong. Didn't need water, food, protection or us. Natural tomato plants.

Well, standing there, I saw some similarities between what happens to some package bees sometimes. Moved from warm and wonderful south Georgia or northern California to northeast Ohio, those bees went from perfect to, well, let's just say less than perfect. They need food because it's too early for any around here for some time, and protection, and, and, and.

Meanwhile, that swarm hive from last year over there is doing just fine thank you. Got food, got protection, got a queen, got it made. A natural hive.

My natural tomato will get the benefit of some of the broadcast fertilizer, the irrigation the whole garden receives, and I'm pretty good about removing any pests I find. Disease shows up, the whole plant goes away so there's no residue next year. Kind of the same with those bees. I don't do much with them 'cause I don't have to. But if it's a bust for honey I'll make sure they have enough for winter from somebody else, and I won't let mites get them cause I trap drones and make fall splits. I don't put poison in a hive but I check to make sure they don't get overrun and cause other hives a problem, and if disease shows up, that hive will go away so there's no residue. Maybe this Fall I'll just bury a few ripe tomatoes where I want them to grow next year and see what happens. If they don't grow, it's just more organic material for the soil. If they do, I have a whole natural tomato bed.

•

Second Year Class. A few years ago we had a beginner's class here in September. It was for anybody who wanted to take it but mostly for all the beginners who took their initial class early in the Spring, which only touched on getting honey, Fall splits and *Varroa* control, winterizing, emergency feeding, frame arrangement for food and moving up, and Spring management next year. The second class was a lot more in depth and detailed and it was well accepted. To help I've got Tracy Alarcon, a county inspector who's a darn good beekeeper with a lot of experience and because of what he does has seen just about everything that beekeepers can, and do wrong when it comes to all this Fall, Winter and Spring stuff. If Jim Tew's schedule works he'll be part of the class too.

So we're going to try it again. It'll be all day in early October, from early to late so we get it all in, in a single day, and includes an easy lunch. Since it's starting a bit later in the Fall we'll cover colony health going into Winter, nutrition, Winter protection, frame arrangement, emergencies, feeding, and emerging into next Spring alive and well and ready to go. We'll send out details in the BUZZ and on Facebook and twitter so watch for those if you're interested. We'll even send along local hotel info. Stay tuned.

•

It's August. It's hot. And you absolutely need to pay attention to what's going on with your bees. This is when *Varroa* kicks butt, and if you weren't on top of it in July, you got about a week to get it in gear. If you treat, treat now if populations indicate. If you make Fall splits, do it yesterday so you can get those queens up and running before winter. If you don't do anything, at least check mite populations so you know if you are the villain in the neighborhood spreading mites and causing *Varroa* bombs, and especially check so you know early on if someone else is doing it to your bees. It's hot. Wear a wet bandana around your neck when you go to the bees to keep you cool, and keep your smoker lit, your hive tool handy and your bee veil tight. Next year has already started.

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It's Summers Time –

Chickens, Mowing, Just Being Outside

I hope you are all having a wonderful, sunny, warm – but not too warm – Summer.

We took a couple of extra days off around the Fourth of July holiday and spent almost the entire time outside – gardening, mowing, sitting on the deck til after dark. It was grand. I'm pretty sure I could have been a farmer. Except for the occasional snake, I love our yard and being outside, even if it's pulling weeds or just puttering around. Thanks to Kim's horticulture background and amazing green thumb we have a deck filled with different kinds of plants.

And thanks to help from daughter Jessica and borrowed child, Jake, I think we will have an amazing garden this year. Of course as I type this it is pouring down rain and is supposed to do that everyday for the next four days. It seems it's either feast or famine when it comes to the rainfall.

The mowing is my job at our place and I have to say I've always enjoyed mowing, especially since I now have a nice riding mower. But even when I had a push mower I didn't mind it at all. I find it very soothing to be able to hear nothing but the mower – no traffic, no neighbor's dog barking. My mowing techniques are a little unorthodox and would probably bother some of you compulsive line mowers. You know who you are! I don't mow in a straight at all, partly because we have so many trees, bushes, beehives and stuff to mow around. And don't forget the compost bin we finally built last year. But mostly I just don't want to mow in a straight line. I like just rambling around the yard taking an assessment of what's going on. Are there trees that are dying or not doing well, are the bees flying that day (I've gotten stung a few times as I go zooming by the hives), what are the chickens doing and what about the sheep across the road. Lots to see while getting the grass under control.

The 'rooster' is the odd one in the bunch. The white ones are Light Brahmas and the gold are Buff Orpingtons. We had two other Americaunas, but lost them as babies.

Kim, Jake and Jessica getting the garden in.

It seems we may have gotten a rooster in this last batch of chicks that are about 12 weeks old. My son and I were checking out the 'babies' because he hadn't seen them for awhile and one just stood right up and crowed – three times. Haven't heard it since then and it's hard to tell by looking because it's one of the Americaunas and they don't have the huge, obvious comb and waddle. But, I'm pretty sure we have a rooster. So I guess we'll wait and see how it goes. We may relocate him to the neighbor's pen if he starts getting nasty. I'll keep you posted.

The rest of the Summer will be busy as usual for Kim and I with lots of travel. We've been home for a while now, but soon we're off to EAS in Delaware the first week of August. After that to Asheville, NC the end of August for the Beekeeping Institute where Kim will be teaching along with Shane Gebaur, Steve Repasky and Jennifer Berry. Then in September we're going to WAS in California.

Don't forget about our annual event in September, the Voices of Bee Culture, right here in Medina. We hope you get signed up and join us. It's going to be fun!

Have a great rest of your Summer!

Thank you Kim, for the deck full of beautiful plants.

The History Of The British National Honey Show

Val **Rhenius**

The National Honey Show grew from origins in 1921 of a joint honey show held by two county associations in south east England, Kent and Surrey. It was first held at the famous Crystal Palace.

By 1932 the show was held regularly each autumn with the primary objectives to benefit the community at large by encouraging beekeeping, pollination, and so the production of fruit, seeds, vegetables, flowers and honey.

Secondary objectives covered any show or exhibition in connection with apiculture, and their awards and prizes, closer association of beekeepers and beekeeping associations, and to further education, lectures, classes, and examinations to advance the cause of apiculture.

Even before its first show, the trustees of Crystal Palace presented a very splendid trophy which featured on the cover of all schedules up to 1935. Associations originally competed for the cup in a class for 12 sections, 12 jars each of light, medium, dark and granulated honey, and 1 lb beeswax is still awarded today. These days individuals compete for the cup in a class for nine jars and one shallow comb.

A few weeks after the 1936 National Honey Show, the Crystal Palace, which had a wooden infrastructure, spectacularly burned to the ground. My father, a retired beekeeper, then aged 12, watched the Palace burn from his bedroom window. The Crystal Palace was never rebuilt and the National Honey Show had to find a new venue if it were to continue.

Over the years since then, the National Honey Show has been held almost every year, excepting a few years during the war, and at several different venues in south, fairly central, and west London. The requirement for an area for competitive exhibits, lecture rooms, a trade hall plus more recently workshop classrooms, as well as office and catering facilities, good access, and parking, has been a considerable challenge as the show has grown. Staging plus other display equipment has to be stored and transported to and from the show, and as the show is run entirely by volunteers, a reliable, experienced and willing team local to the venue is essential.

The show struggled financially in its early years, but now has an income from bequests, membership, show entry fees and support from the trade hall, plus occasional sponsorship from various organisations and charities. However each move to a larger venue has generated a considerable hike in costs, the latest in 2016 to Sandown Park Racecourse has brought all the aspects of the show under one roof and proved very popular. BC

Reference:

A Short History of the national Honey Show A National Honey Show Publication.

The 2017 National Honey Show is October 26-28
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FOUND IN TRANSLATION

Minerals And The Bees' Needs

Jay **Evans**, USDA Beltsville Bee Lab

Rachael Bonoan and colleagues at Tufts University have been studying the impacts of salt and other minerals on honey bee health for several years. This work is spurred by historical observations that honey bees often choose murky water sources over pristine ones, arguably reflecting a search for resources that are scarce in pollen and nectar. Writing in Ecological Entomology (**http://onlinelibrary.wiley.com/doi/10.1111/een.12375/pdf**), the authors describe a clever bee 'cafeteria' used to build the case that bees on water foraging trips can identify minerals and selectively drink those waters highest in specific minerals, from salts to calcium. Their results hint at a seasonal shift in forager preferences for specific minerals coinciding with changes in pollen availability and consumption. While more could be done to determine whether bees actively search out specific minerals or are simply less choosy in certain times of the year, the results do suggest that water-collecting bees, like those foraging for pollen or nectar, are somehow driven by the hive mind.

Pierre Lau and James Nieh in San Diego took a lab-based approach to address similar questions (**doi:10.1242/jeb.132019**). Their study relied on a behavioral technique widely used for everything from age-based learning to measuring the impacts of pesticides on bees. They used this technique, the Proboscis Extension Reflex (PER), to determine the concentrations at which worker bees favor or avoid minerals found in water. They, too, showed a general preference for salty water, at concentrations far higher than levels observed in nearby water sources. Interestingly, individual bees from the same hive differed greatly in their desire for salt. In statistical terms, the salt preferences among bees from the same hive were far more variable than were average differences across hives. This result suggests that current nutritional status for those bees, past foraging experiences, or even genetics, can impact the desire for salt and other minerals. These authors also found that minerals both attracted and repelled worker bees. As an applied output for this result, the authors suggest that bees could be warned off from toxic waters if these waters were also marked with high levels of repellent minerals such as potassium.

Both studies provided a happy opportunity to revisit the elegant and practical nutrition research of Dr. Elton Herbert, Jr., a USDA-Beltsville honey bee scientist in the 1970s and early 1980s who died too young. Herbert was conversant in all components of the honey bee diet and used a series of experiments to test the favorability of minerals for bee health. In developing what would become the 'Beltsville bee diet', he and Hachiro Shimanuki showed that a mid-range level of minerals in an artificial bee diet led to greater growth than did low- or high-salt mixes (**http://dx.doi.org/10.1080/00218839.1978.11099916**). He also tested the impacts of pollen-based versus 'mined' minerals on bee health (**http://dx.doi.org/10.1080/00218839.1979.11099958**), showing that pollen ash derived from a custom blend of pollens led to the strongest brood growth when compared to a low-mineral diet or one supplemented with Wesson's salt, a product with >10X as much sodium. In contrast to the recent studies, bees were LESS likely to consume mineral-rich diets versus control diets lacking those minerals.

Supplementing a plant-based diet with alternative sources of minerals is of course not limited to bees. Butterflies and other insects routinely collect minerals from puddles and other impure water sources. Similarly, entire industries have been built around efforts to attract and/or sustain salt- or mineral-crazed domestic and free-living mammals. In an analogous 'cafeteria' study, Jose Estevez and colleagues in Spain showed that deer change their preferences for several minerals across seasons, reflecting their needs (**DOI: 10.1071/AN09012**). Similarly, Pablo Gambín and colleagues showed that red deer engage in 'osteophagia', or the consumption of antlers and bones, during seasons when calcium needs are highest (**DOI 10.1007/s10344-017-1095-4**). As a further extreme, deer and other large grazers occasional harvest *living* animals, feeding on their skeletons when the available forage does not provide enough calcium. As with the honey bees, studies of mammalian feeding behavior have led clever researchers to new insights into dietary needs and new recommendations for increased growth. Hopefully this work will further improve the many artificial diets and supplements available for honey bees. BC

A Closer Look

TROPHALLAXIS

Clarence **Collison**

Trophallactic interactions can frequently be seen non-randomly between all members of the colony.

Trophallaxis, the transfer of food by mouth from one individual to another, occurs among adults of honey bee colonies (Crailsheim 1998). The drones and the queen consume but do not donate, while the workers are recipients and donors. They share the content of their honey stomachs and sometimes the products of their head glands. Such trophallactic interactions can frequently be seen non-randomly between all members of the colony. Their occurrence and success depend on factors such as sex and age of the consumers and donors, food availability and quality, time of day, weather and season.

For the youngest workers, old workers, drones and the queen this flow – especially the flow of protein has definite nutritional importance since these bees need protein but have only a limited capacity to digest pollen and consume none or only small amounts of it. The system of trophallactic food flow and the existence of a specialized group, the nurses, who are responsible for consuming pollen and processing it into easily digestible jelly enables the colony to have many members with a reduced digesting capacity. Bees that store food specialize in transporting harvested nectar within the hive, receiving it from foragers near the entrance and depositing it in other parts of the hive where it is processed into honey. This saves time and helps the foragers to harvest available food sources more efficiently. In addition to its nutritional value and the importance of transfer to specialists, receiving and donating food in the trophallactic flow of food provides information to colony members about the quality and quantity of food existing in the hive and therefore can be compared in its importance with the dance language and communication by pheromones (Crailsheim 1998).

Nectar Foraging

Trophallactic behavior is normally initiated by a bee asking for food, by protruding her tongue toward the mandibles of another bee, termed the donor if the contact leads to a transfer. The antennae of the recipient are directed towards the donor. The donor's antennae are kept more or less downward and close to the head. The antennae of both individuals touch each other frequently. This antennal contact is important; if it is hindered by partial or total amputation, the success of transfer is reduced. A donor may offer food with or without being asked. A food droplet, the size of which may vary, is kept between the mandibles and the prementum, and is sucked up by the recipient's tongue. A transfer to a worker might last from a few seconds up to a few minutes (Crailsheim 1998).

During periods when the colony needs a lot of water, foragers may switch from collecting pollen or nectar to water collection. This water is transferred to other bees in the colony by trophallactic contacts and is deposited into cells (Park 1923). It is used for several purposes, such as: to dilute honey in spring when brood rearing increases, to thermoregulate the colony during hot weather and as a reserve if the metabolic water produced by a bee does not fully cover its needs (Louw and Hadley 1985).

Trophallactic behavior may also be involved in the distribution of pheromones within the colony. Queen honey bees produce pheromones that mediate and integrate the worker's activities (Velthuis 1972; Slessor et al. 1988, 1990; Kaminski et al. 1990; Keller and Nonacs

"Trophallactic behavior may also be involved in the distribution of pheromones within the colony."

1993; Engels et al. 1997). These pheromones are not only evaporated and transferred by antennal contacts (Seeley 1979; Ferguson and Free 1980; Naumann et al. 1991), but also distributed upon their body surface. From there they are licked by bees surrounding the queen, the royal court (Allen 1955). As individuals of the colony participate in the trophallactic flow, pheromones are distributed to all hive members in this way (Butler 1954), although the transfer by antennal contact seems to be the most effective and fastest manner.

Trophallaxis by honey bee foragers was studied under the experimental conditions of an arena. The behavior of pairs of bees, one (donor) fed with 50-µl sucrose solutions and another unfed recipient, was analyzed as a function of the sucrose concentration, the concentration at constant viscosity (kept constant by adding tylose, an inert polysaccharide), and the viscosity of a 30% sucrose solution. By increasing the concentration of solutions, the rate at which the solution was transferred to recipient bees (transfer rate of solution, in µl/second) increased up to a maximum value for 30% sucrose solution, and decreased beyond this concentration (concentratrion experiment). At constant viscosity, no modulation was observed for the lower sugar concentration range (10-30%), while the transfer rate of solution clearly increased beyond 30% (concentration experiment at constant viscosity). For the 30% sucrose solution, the transfer rate decreased with increasing viscosity (viscosity experiment). If only the sucrose compound is comparatively analyzed, the transfer rate of sucrose (in mg/second) increased similarly in the first two experiments. These results give behavioral evidence suggesting that donor bees are capable of modulating the trophallactic food transfer as related to the sucrose concentrations carried in their honey stomachs within a considerable wide range, but viscosity prevents it. It also suggests that trophallactic transfer rate does not depend on abdominal volume, for even when all donor bees attained similar loads (50 µl), transfer rate of solution increased along with the offered sucrose concentration (Tezze and Farina 1999).

Forager bees returning to the hive after visiting a nectar source unload the collected liquid food to recipient hivemates, through mouth-to-mouth food exchange contacts (trophallaxis). Wainselboim and Farina (2000) analyzed whether the main characteristics that define nectar in energetic terms, that is, rate of production (flow of solution), sucrose concentration and rate of sucrose production (sucrose flow) influence trophallactic behavior. Individual bees trained to feed at a regulated-flow feeder offering sucrose solution were captured once the foraging visit was complete and placed in an acrylic arena with a recipient bee that had not been fed. The rate at which liquid was transferred during the subsequent trophallactic contact (transfer rate) was analyzed as a function of the different solution flows and sucrose concentrations offered at the feeder.

A relationship was found between transfer rate during trophallaxis and the flow of solution previously presented at the feeder. This relationship was independent of sucrose concentration when above a certain threshold value (ca. 22% weight on weight). They also analyzed whether the rate of sucrose deliverance of the food source (sucrose flow) influenced the rate at which the solution was transferred. No clear relationship was found between the rate of sucrose deliverance during trophallactic events (sucrose transfer rate) and the sucrose flow presented at the feeder.

Upon arriving at the hive from a successful foraging trip, the speed at which the liquid is transferred (unloading rate) from donor to recipient is related to the profitability offered by the recently visited food source. However, because a forager's evaluation of the profitability of a food source, as measured by dancing behavior, is influenced by previous foraging experience, Wainselboim and Farina (2003) investigated whether trophallaxis might also be influenced by previous foraging experience. They measured unloading rate for a given profitability condition at the food source (in terms of solution flow rate) in three groups of foragers that differed in their previous experience at the source. One group experienced the same flow rate of solution in five successive visits (control group), another group experienced a lower flow rate in the first four visits and the third group experienced a higher flow rate in the first four visits. Their results showed that bees trained to a lower flow rate increased their unloading rate compared with the control group, indicating an influence of past foraging experience on

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"Upon arriving at the hive from a successful foraging trip, the speed at which the liquid is transferred (unloading rate) from donor to recipient is related to the profitability offered by the recently visited food source."

their evaluation of food source profitability. This influence was not observed in the group trained to a higher flow rate, which responded similarly to the control group. Additional experiments indicated that foragers appear to evaluate the profitability of the source by integrating an overall flow rate throughout the entire visit, instead of measuring only the current flow rate delivered by the feeder.

The interplay between the recruitment dance and food-giving trophallactic contacts of returning foragers were analyzed (Farina 2000). Dancing and trophallactic events were recorded for bees returning from a rate feeder that provided 50% weight on weight sucrose solution at a constant flow rate of 5 µl min^{-1}. Bees that had danced immediately before their trophallactic contact had more recipients per trophallaxis compared with bees that did not dance before. Thus, besides information coded in dancing behavior, dance maneuvers could serve as a stimulus to increase attention of bees located on the dance floor to receive nectar. In addition, the number of bees receiving food during a trophallaxis showed a positive correlation with the probability of dancing immediately after contacting. The time from arrival at the hive to when the first or the subsequent contacts took place presented no correlation with the probability of dancing after trophallaxis. Also, the duration of a trophallaxis was positively correlated with the number of recipients per trophallaxis. These results suggest that returning foragers could receive information during a trophallactic contact with their hive mates that modify thresholds for dancing. Dance maneuvers and trophallactic contacts performed by foraging bees seem to be "mutually" affected.

Pollen Foraging

Pollen foragers quickly sense increases in colony pollen stores, and modify their foraging activity appropriately. In association with these changes in foraging behavior, nurse bees transfer a larger portion of newly synthesized ^{14}C-phenylalanine-labeled protein to the foragers. These findings support the hypothesis that trophallactic interactions between nurse bees and pollen foragers may serve as a cue apprising pollen foragers of the colony's need for pollen (Camazine et al. 1998).

"Pollen foragers quickly sense increases in colony pollen stores, and modify their foraging activity appropriately."

Protein for honey bee larval development is derived from the digestion of pollen. Adult bees also require protein (Crailsheim 1986; 1990a). However, not all bees consume and metabolize pollen equally well. Workers approximately eight days old are the colony's primary pollen processors and distributors. They act as nurses, feeding proteinaceous hypopharyngeal gland secretion (jelly) to the larvae. They also feed jelly to other colony members (Crailsheim 1990a, b, 1991). The gastrointestinal tract of these pollen processor bees has the highest pollen content and their midgets have the highest proteolytic activity of all bees in the colony (Moritz and Crailsheim 1987; Crailsheim et al. 1992). In addition, their hypopharyngeal glands are especially well developed (Moritz and Crailsheim 1987; Crailsheim and Stolberg 1989). In contrast, pollen foragers themselves consume little pollen, have little enzymatic capability to digest pollen, and have atrophied hypopharyngeal glands (Moritz and Crailsheim 1987; Crailsheim 1990a). Thus, the pollen processors serve as the colony's consumers and distributors of protein through trophallaxis, while foragers act as the pollen collectors.

Early reports indicate that trophallaxis may allow honey bees to assign nectar odors with predictive values to anticipate biological meaningful reward stimuli. Nevertheless, this type of learning has not been addressed directly. Gil and De Marco (2005) paired bees in isolation to induce trophallaxis under controlled conditions and afterwards, the honey bee proboscis extension reflex was used to investigate the possible role of trophallaxis in learning olfactory cues. Their results demonstrated unambiguously that associative learning actually occurs by means of trophallaxis. Bees associate the odor (as the conditioned stimulus, CS) and the sucrose (as the unconditioned stimulus, US) present in the solution they receive through trophallaxis. Moreover, this particular kind of learning leads to long-term olfactory memories after a single learning trial, even when trophallaxis is brief. In addition, they found that the strength of association is clearly affected by CS and US intensity as well as the recent previous foraging experiences of the bees. BC

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Clarence Collison is an Emeritus Professor of Entomology and Department Head Emeritus of Entomology and Plant Pathology at Mississippi State University, Mississippi State, MS.

Thank You to All Participants!

Survey numbers are in: Beekeepers who responded to the *11th annual loss survey* ***lost a total of 33.2% of their colonies*** over the course of the year. **This is the second lowest rate** of annual colony loss recorded over the last seven years when we began surveying annual loss. ***More than 4,900 beekeepers from all 50 states responded to this year's survey.*** All told, these beekeepers are responsible for about 13 percent of the nation's **estimated 2.78 million managed honey bee colonies.**

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THE CHALLENGE

Part 2, Developing An Environmentally Friendly Miticide

David **VanderDussen** and Kathleen **Ireland**

In Part 1 of this series we discussed the role of NOD's biochemistry laboratory in the development of a miticide. Once a test biopesticide formulation is developed and passes through the initial screening processes in the lab, then the next three questions are what do the bees think of it, how well does it work, and what about residues in the honey? It is time to go out into the field to conduct in-hive studies with the bees!

Determining constraints on use.

There are four key factors that needed to be determined when setting contraints on the use of a miticide: functional dosage, optimal environmental condition range, product placement in the hive and treatment periods.

We already know that *Varroa*, tracheal and tropilaelaps mites are more susceptible to formic acid vapors than the honey bee colony is, which is why we can use it as a miticide. But how much is needed, and how much is too much?

Dosage determination

To determine functional dosage in the field we made up small packets of the formic acid saccharide gel in the wicking material and started applying them in a series of hives. For examples, see the series of photos, starting with a single packet in the heart of the brood rearing zone, and going up to 12 packets. Colony response and *Varroa* mite mortality was monitored for the series of hives in each group. Results: A single packet had little effect, a significant positive effect was observed at three packets, and no additional beneficial effects were observed after six packets.

Now that dosage had been determined, we could refine the presentation of the technology into formulated strips: one strip = three packets. An optimal, single application full dose treatment is two strips, laid centrally across the

frames in the heart of the brood rearing zone of the hive.

Environmental Conditions

Beekeepers need to know the environmental conditions under which they can apply the product: How hot can it be? How cold? Is humidity a factor? Fortunately, we could turn to the bees for guidance, but will start by looking for weaknesses of the pest.

Targeting the *Varroa* Where They Reproduce. As well as charging the brood chamber air, the formic acid vapors released from NOD's formic acid gel strips can penetrate the brood cell cap and can cause significant mortality to all the stages of the developing mites. Therefore, all life stages of the *Varroa* are viable targets for treatment with NOD's technology, optimized by the strips being applied in the brood rearing zone. This is supported in the literature.[1,2]

***Varroa* Physiology:**

Varroa mites are arthropods.[3] The female *Varroa* develops its hard, dark red chitin shell in its final moult, preparing it for the world outside of the brood cell, whereas the male

[1]Eguaras, M. et al, Varroa Jacobsoni Control with Formic Acid in Different Application Ways in Subtropical and Temperate Climates. Apiacta 3, 2001

[2]Rosenkranz, P., Aumier, P., and Ziegelmann, B. Biology and Control of Varroa Destructor, J. of Invertebrate Pathology 103 (2010), S96-S119

[3]https://en.wikipedia.org/wiki/Arthropod

Varroa just lives long enough to mate with his sisters in the brood cell where it is born; it does not develop the hard chitin shell, so are a softer target. After the brood cell is capped it takes the male *Varroa* over 10 days to reach sexual maturity, so in worker brood there is only a few hours during which mating can successfully take place before the adult bee emerges. As long as the males can be significantly damaged or killed before they reached sexual maturity, even if their siblings survive treatment, the next generation will be unable to reproduce.

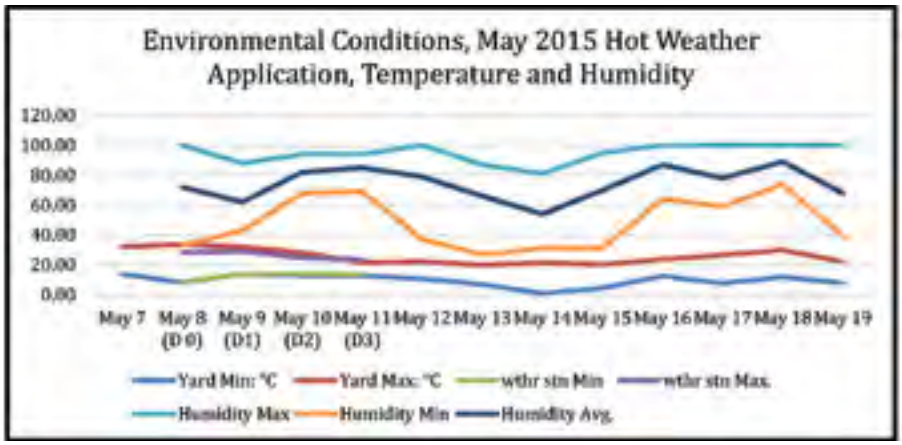

Figure 1

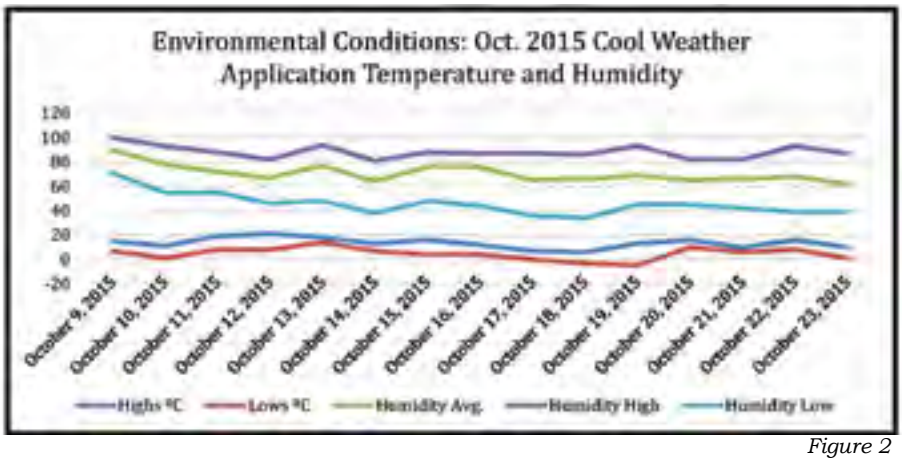

Figure 2

Harnessing Bee Behavior

With this in mind, NOD wanted to work with the bees, to harness their social abilities to incubate the brood rearing zone and to move air through the brood chamber. Additionally, we noted that honey bees cluster at ~50°F, so, to minimize disruption to colony activities we saw a desirability to apply the product above that temperature. Once the product is applied, lower temperatures, day or night, are not a concern because of the temperature maintained by the bees in the brood rearing zone.

Determining the upper temperature limit at the start of treatment was more of a challenge because the initial surge of formic vapor release during the first three days of treatment needs to be taken into consideration. This is presented below in the section "*How Much Formic Acid Vapor is Required to Kill Varroa?*"

The bees maintain an incubation temperature in the brood rearing zone of ~95°F (35°C), and keep the environment humid to keep the larva from drying out. Initial tests indicated that the product could be safely applied at ambient temperatures up to 92°F (33°C) in the beeyard; subsequent experience provided information that under 86°F (30°C) provoked less of a negative colony response, so an upper temperature limit for the day of application was set at 85°F (29.5°C), along with precautionary statements for the first two days of treatment.

For confirming the temperature ranges for *Formic Pro*™, two studies were conducted. The temperature and humidity charts are Fig. 1 and Fig. 2.

How much formic acid vapor is required to kill *Varroa*?

A review of the literature indicates that the minimum concentration of formic acid required to cause mortality to *Varroa* has been determined to be >19 parts per million (ppm) over an extended period of time.[4] NOD

[4]Underwood, RM. et al, Effect of Concentration and Exposure Time onn Treatment Efficacy Against Varroa Mites (Acari: Varroidae) During Indoor Winter Fumigation of Honey Bees (Hymenoptera: Apidea) With Formic Acid. J Econ Entomol 98(6), 1802-1809, 12 2005


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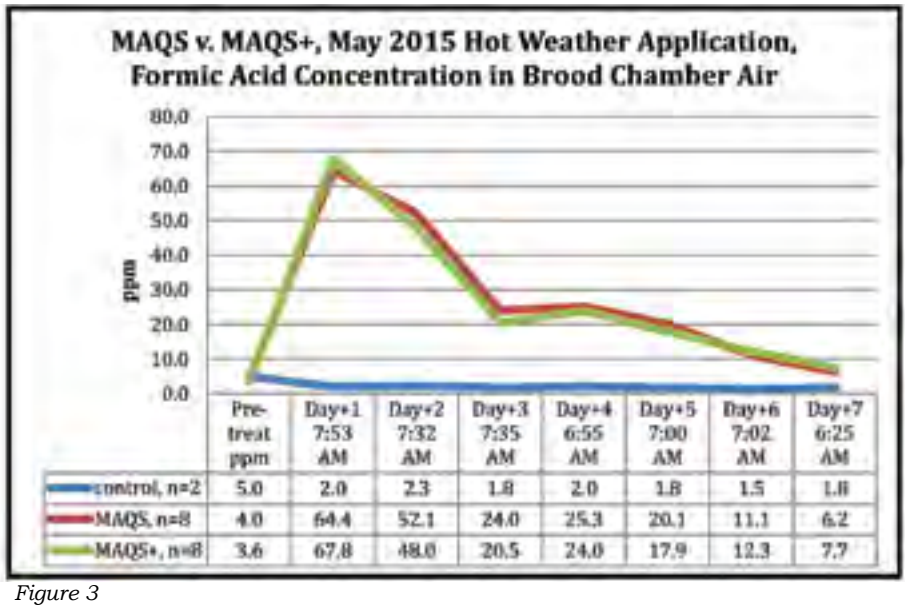
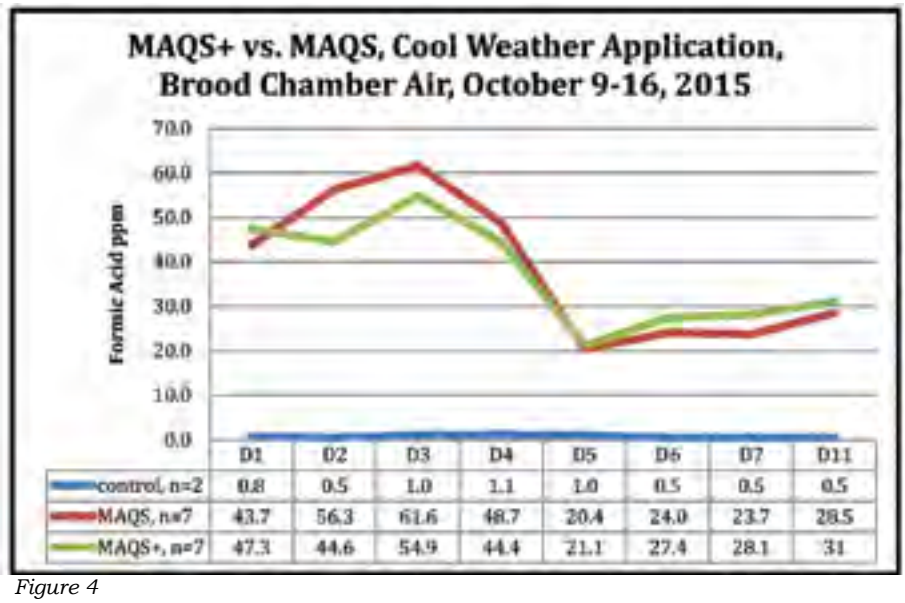


	Pre-treat ppm	Day+1 7:53 AM	Day+2 7:32 AM	Day+3 7:35 AM	Day+4 6:55 AM	Day+5 7:00 AM	Day+6 7:02 AM	Day+7 6:25 AM
control, n=2	5.0	2.0	2.3	1.8	2.0	1.8	1.5	1.8
MAQS, n=8	4.0	64.4	52.1	24.0	25.3	20.1	11.1	6.2
MAQS+, n=8	3.6	67.8	48.0	20.5	24.0	17.9	12.3	7.7

Figure 3



	D1	D2	D3	D4	D5	D6	D7	D11
control, n=2	0.8	0.5	1.0	1.1	1.0	0.5	0.5	0.5
MAQS, n=7	43.7	56.3	61.6	48.7	20.4	24.0	23.7	28.5
MAQS+, n=7	47.3	44.6	54.9	44.4	21.1	27.4	28.1	31

Figure 4

decided to set 20 ppm within the brood rearing zone as its target baseline. The bees can vent out amounts that are above their comfort level as long as the hive entrance is fully open. Testing the concentration of formic acid in the brood rearing zone air became part of our studies.

Using calibrated air sampling tubes, research technicians are able to draw air out of the brood rearing zone of a hive and determine the level of formic acid present. Naturally we wanted to know the concentrations at the extremes of the temperature limits previously discussed, so set up studies to find out.

The results can be seen in Fig. 3 and Fig. 4. Under hot weather conditions the strips were considered spent by Day 7, due to the bees performing rapid air exchange during such weather conditions. Under cooler weather conditions the strips remained active several days longer. Please note that Beta names are assigned to the test products. MAQS is the product first registered in 2011 (*Mite Away Quick Strips*™), the test product is referred to as MAQS-ESL or MAQS+; the trade name for the final version registered in the U.S. is *Formic Pro*™.

Now we have determined that the NOD developed strip technology releases adequate amounts of formic acid vapor over an extended period of time, lets take a look at the efficacy using internationally accepted methods.

Efficacy

To determine efficacy we follow the study guidelines established in the European Union.[5] We outfit the hives with bottom boards that have removable drawers to accommodate an inserted sticky board. We treat with the test product as per a research study label, then, after the completion of a brood cycle, we treat with a proven product with a different active ingredient. Because we have relied on formic acid since 2002, and resistance to Fluvalinate had not shown up in colonies being tested, we are able to use Apistan® as the critical treatment.

Good science is a lot of work!

In the study conducted in the fall of 2016, from 36 colonies kept in three locations 97,028 mites were collected on over 400 sticky boards. Many hours go into just prepping the sticky boards. We

[5]15 November 2010 EMA/CVMP/EWP/459883/2008 Committee for Medicinal Products for Veterinary Use (CVMP) Guideline on veterinary medicinal products controlling *Varroa destructor parasitosis* in bee.

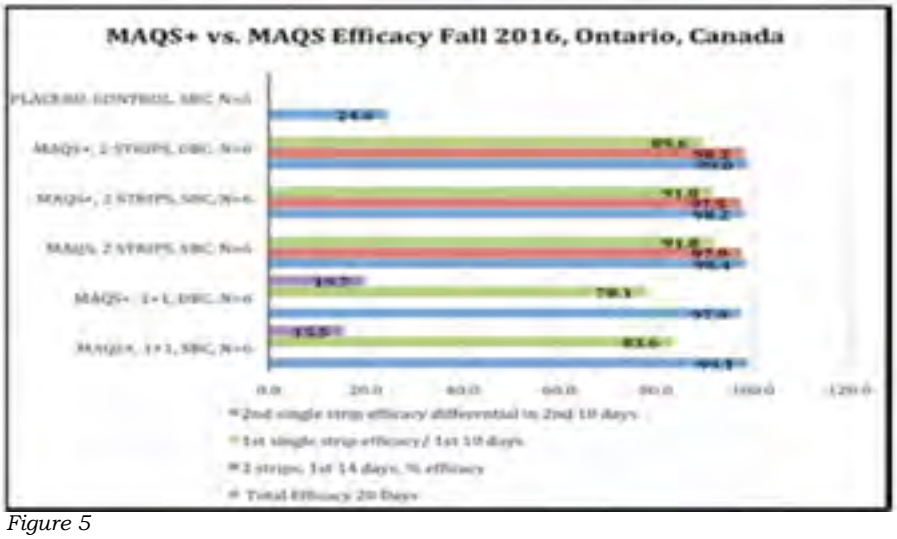


Figure 5

outsource mite counting to third-party temporary workers that work for many hours under bright lights through magnification lenses. Once counted, the results are tabulated. Fig. 5 is the efficacy data from the Fall 2016 study.

Once our initial field studies were completed in 2014 we started to release some product to third-party field testers and researchers, wanting their feedback. We wish to send a heart-felt thank-you to all of the collaborators that field tested the beta extended shelf life strips and gave us their feedback in 2015 and 2016. In response to the feedback we focused on fine tuning the manufacturing process to ensure that the gel extrusion was compressed out to better fill the Ecopaper wrap, thereby expanding and enhancing the gel-to-wick contact area, thus increasing the efficacy of *Formic Pro* to over 95% efficacy, in line with *Mite Away Quick Strips*.

Impact on colony health monitored

In all the studies conducted we monitored the impact of treatment on colony health. Some young brood mortality, triggered supersedure of fragile queens, and an increase in adult bee mortality at the hive entrance may be observed at the start of the treatment period. This is in line with the published literature.[6]

[6]Underwood, RM., and Currie RW. (2007) Effects of release pattern and room ventilation on survival of *Varroa* mites and queens during indoor winter fumigation of honey bee colonies with formic acid. Canadian Entomologist, Vol. 139, Issue 6, 881-893

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To minimize the symptoms of varroosis, for most regions we recommend that colonies be treated in the spring to protect the summer bees that will be going into the honey flow, and to treat again early in late Summer to protect the bees that will become the Winter cluster. Additional treatments may be required in warm regions where colonies rear brood most of the year. Missing a treatment or treating too late can lead to irreversible colony decline, so it is important to monitor the *Varroa* mite levels in your hives so treatments can be applied in a timely manner. BC

That's it for this month. In Part 3 we will look at the impact of treatment with Formic Pro on the formic acid and total free acid levels in honey, and take a look at the registration process required to be able to make a product available in the marketplace.

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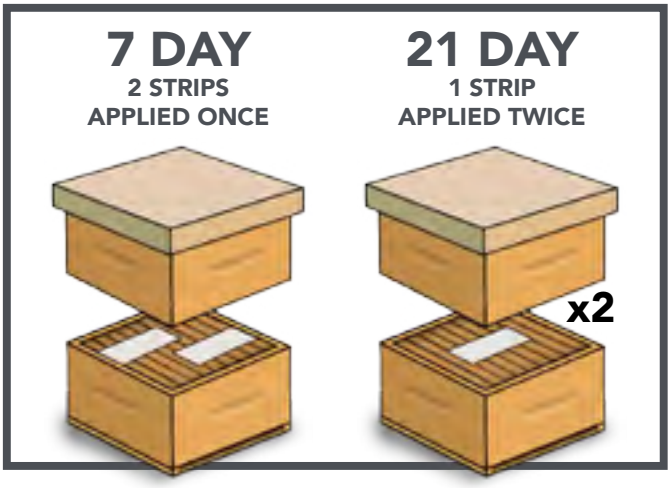

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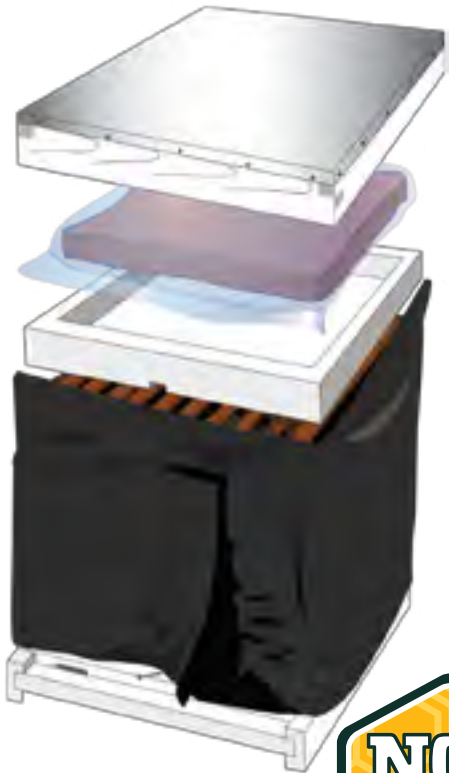

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Honey Bees, Antibiotics & Gut Microbia

Rebecca **Novak Tibbitt**

The role of antibiotics is both good, and bad in honey bee microbia.

Researchers at the University of Texas, Austin, led by postdoctoral researcher Kasie Raymann, PhD, and Nancy Moran, PhD, have uncovered a potential clue to one of the causes of honey bee decline that has confounded beekeepers for the last decade. Their research points to an unlikely source: the intestinal tract of the honey bee and the diverse microbial lifeforms that call the honey bee gut home. While microbiologists have been intrigued with the role of the microbiome for some time, only recently has its significance made its way down to the general public. Further, the role of antibiotics has come to be better appreciated as an important weapon against disruptive, "bad" bugs, but that also carries the unintended consequence of killing "good" bugs, often underappreciated until they are gone.

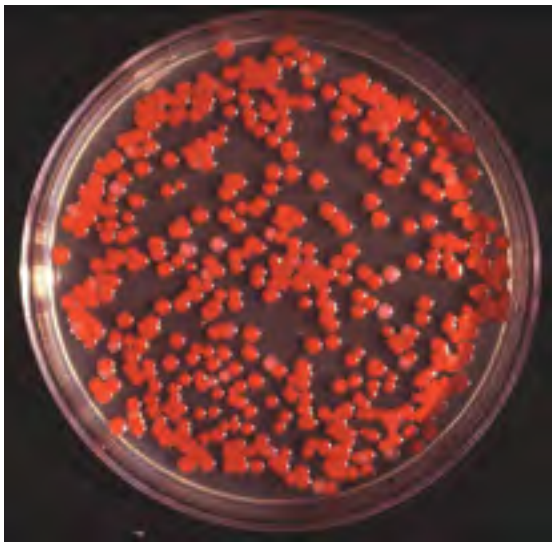
The latest research, published in the Open-Access journal *PLOS Biology* in March 2017, advanced the understanding of honey bee gut microbiota from the groundbreaking work of Moran and her team. (See the January 2017 *Bee Culture* article, "Honey bee Gut Microbiota"). With a better appreciation of the important role that a healthy honey bee gut microbiome plays, Raymann and Moran set out to disrupt gut symbiosis in healthy bees in long-established rooftop hives on campus to see what would happen. According to Raymann, the most obvious way to do this was through antibiotic application.

The results were unexpected. Within a week of treatment with the commonly-used antibiotic tetracycline, twice as many bees in the treatment group were dead as compared to the control group. Further examination explored which organisms in the honey bee gut perished and which ones flourished. Healthy microbes – the good bugs – that aid in the digestion and absorption of nutrients and also keep harmful microbes – the bad bugs – in check were decimated. The opportunistic bacteria *Serratia*, omnipresent, but typically under control in a healthy gut environment, rapidly colonized in the gut and was a likely suspect in the cause of death.

Raymann and Moran's research demonstrated, for the first time, that:

- antibiotic treatment can have persistent effects on both the size and composition of the honey bee gut and microbiome
- antibiotic exposure resulted in decreased survivorship – by 50 percent – both in the hive and in laboratory experiments in which bees were exposed to opportunistic bacterial pathogens
- together, these results suggest that dysbiosis resulting from antibiotic exposure affects bee health, in part due to increased susceptibility to ever-present opportunistic pathogens

I connected with the two researchers to learn more about their findings, the role that antibiotics and other treatments play on honeybee gut health, as well as antimicrobial resistance.



Serratia marcescens.

What led you to conduct this research?

KR: The main point of the study was to perturb the microbiome in order to better understand its role in honey bee health. Using antibiotics was an easy way to go about doing this because we know from experimental studies in other animals that it would, in fact, have an effect on the gut community. We weren't expecting the results we saw in terms of survival. The main idea was to study the microbiome and its effect on the health of the honey bee as opposed to looking at the effect of antibiotic application.

NM: From previous long-term research, as well as research in humans and livestock, we knew that antibiotics disrupt the gut microbiome. However many experiments are in the lab with germ-free bees that we can compare. This is unrealistic in a real-world setting. In the hive, we can't have germ-free bees because they immediately get microbes from their nestmates. This study was a different experimental approach, to disrupt them and then look at more realistic hive conditions.

One of your key findings was how quickly antibiotics affected the gut microbiota – the first day that you tested the bees after five days post-treatment. Were you expecting this?

KR: Yes, I was expecting it, and actually expected to see a difference a little quicker. If you look closely at the results, after five days post-treatment, there wasn't much change. We're not sure why there wasn't a huge and immediate impact, which is what we were expecting.

Your study showed significantly decreased survival. Yet, antibiotic application for the prevention of American Foulbrood (AFB) is a long-held practice among commercial and backyard beekeepers. Do you expect/suspect that many will continue this practice despite your findings?

KR: For newer formulations beekeepers need a prescription based on new FDA regulations. This might cause less use of antibiotics. But overall, we're not sure how this research will be received.

NM: If there is a pathogen like American Foulbrood it's alarming when a beekeeper sees it. On the other hand, if adult bees become infected with *Serratia*, they fly off and die. It's not apparent as AFB. This study shows half survival rate; this would be subtle if you just put antibiotic on the hive. You might not necessarily notice, you might just think the hive is not doing as well.

On January 1, 2017, new FDA regulations went into effect requiring a prescription for Terramycin (oxytetracycline) and Tylan (tylosin), two of the most commonly used antibiotics for honey bees. Do you think this is too little, too late to help restore honey bee gut health in the U.S.?

NM: We've done a lot of surveying. From what we can tell, a healthy untreated hive has close to normal honey bee gut microbiota. All of the organisms are there and some have strains that are resistant to treatment. More or less, if they're not treated (with antibiotics), their gut microbiota appears to be normal.

You draw a parallel to *Clostridium difficile*, a devastating intestinal infection for humans. Is there a similar pathogen for honey bees (e.g., nosema)?

KR: *Serratia* is similar to *C. diff* because it is also an opportunistic pathogen. Like humans, in cases where bees have a complete and healthy microbiota, it's easier to ward off infection.

NM: Like *C. diff*, *Serratia* is always present at a low level; we've seen this repeatedly in lab studies. While it's present, it represents just a tiny proportion over the overall microbiome in healthy bees. But it's always lurking there. When the gut microbiome is disrupted, *Serratia* colonizes under certain conditions and it dominates the community.

Fumagilin-B, a common preventive application for nosema, was not included in your study (and is not part of FDA regulations). Why not? Can the findings from your study be applied to Fumagilin-B? (e.g., should liberal application for prevention of nosema continue to be the standard?)

NM: Nosema is closer to a fungus than bacteria. We have some experiments underway for Fumagilin-B. We can't expect the results to necessarily be the same, it's unknown. The reason that it wasn't included in this study was because it's not obvious that it wouldn't have an effect on the gut microbiota (like an antibiotic would). In this study, it was the *Serratia* pathogens that spring into action in bee colonies. There is a simultaneous study being conducted out of the University of Wisconsin), so this area is starting to be better appreciated.

KR: *Serratia* appears to be a common opportunistic pathogen of honey bees, that in some cases might be transmitted through *Varroa* mites (NL Burritt et al. 2016 PLOS ONE). In fact, there are probably several other bacterial pathogens infecting bees that we don't know about because

Serritia is an opportunistic pathogen of honey bees that may be transmitted by Varroa.

they usually leave the hive to die, so it's difficult to know without seeking them out and testing. But, *Serratia* is promising for future research.

Can your research be translated to Apistan for *Varroa* mite control? Does the same mentality apply in terms of resistance?

NM: Resistance (to treatment) evolves rather predictably. Foulbrood took 50 years; one explanation for that is that the pathogen that causes AFB doesn't only live in beehives, so the entire population was not being exposed to antibiotics. If you kill off all exposed pathogens, it will prevent resistance, because you've completely destroyed the population. But, as we know, this is rarely the case. There is a long history of resistance, and the outcome is fairly predictable.

Our research has mostly focused on bacteria. Treatments for varroa mites aren't necessarily predictive of gut health, so we don't know as much (about resistance to those treatments).

Is it possible to reverse the resistant genes found in the U.S. honey bees? If so, how long would/could that take?

NM: While we can expect the resistant genes to drop in frequency when not faced with antibiotics, they probably won't totally disappear. Some sources of bees that we have sampled for resistance were very recently treated, and some were treatment-free, and probably hadn't been treated in generations. One example of this is feral honeybees in Southern Utah that been there for decades, but originally came from a beeyard. In the U.S., every bee had some evidence of the resistance gene, even if it was at very low levels. In bees from other countries (that don't use these antibiotics), the resistance gene is totally lacking. Incidentally, this is the same case as with humans – once a gene has transferred, it's hard to eradicate.

What steps (big and small) can commercial and backyard beekeepers take to prevent antimicrobial resistance in their bees?

NM: The main thing is not to use antibiotics for prevention; if there is evidence of a severe pathogen, then it's OK to use them. We can say this about humans as well, where antibiotic use has resulted in resistant genes. Antimicrobial resistance with American Foulbrood likely came from honey bees, which was then adapted by the pathogens that caused foulbrood, where there is now a reservoir of genes resistant to treatment.

We can see how bees with a strong gut microbiota gain weight, how it affects insulin levels which signal hunger, how the gut microbiota helps with fat storage and short-chain fatty acid production.

Do you think the findings from this research help to provide a missing piece to the colony decline mystery?

NM: It's what I would call a pet theory, primarily because of the timing. CCD made headlines in 2006, which was when Tylan was first FDA approved. One possibility is that the healthy gut bacteria had developed resistance to Terramycin so it evolved to survive despite treatment. With the newer antibiotic, it conceivably disrupted gut microbiota and exposed the microbiome (and host honey bee) to viruses and bacteria, which led to such large population losses. It's possible that this type of disruption plays a role in the ability to fight off disease and nutritional stress, which is an area of further study.

Were the bees in this study exposed to a "normal" amount of pesticide/insecticides? Do you think exposure to these chemicals also play a role in honey bee gut health?

NM: Living in central Austin, and foraging on ornamentals on campus, I have to believe there is a high use of chemicals by landscaping. This is not an agricultural setting, but I would say the bees in this study were exposed to similar amounts of pesticides as a backyard beekeeper living in a neighborhood. In fact, another graduate student at UT is looking at the effect of glyphosphate (a broad-spectrum herbicide) on bee gut health, and gut bacteria. What we studied doesn't rule anything out in terms of bee mortality – if something new is happening, it's because of something new. Antibiotics are not the only problem.

Until recently, the role of the gut microbiome in both humans and honey bees has been relatively under-appreciated. What are you looking at researching next?

KR: *Serratia* and trying to understand how it affects honey bee health and how and when it is virulent for bees. For example, are bees without a microbiome more susceptible to this infection? Also, as mentioned above, we are in the early stages of determining if and how neonicinotoids affect the microbiome. Lastly, we are interested in more fine-scale changes induced by antibiotics at species level, including different aspects of exposure and infection.

NM: The effect of nutrition on the gut microbiotia and relationship to overall honey bee health is another area of continued research interest. Research has just been published in the journal *Proceedings from the National Academy of Sciences* (*PNAS,* Honey bee gut microbiota promotes host weight gain via bacterial metabolism and hormonal signaling, May 2, 2017, vol 114, no. 18) on this very topic. We can see how bees with a strong gut microbiota gain weight, how it affects insulin levels which signal hunger, how the gut microbiota helps with fat storage and short-chain fatty acid production. If we can show how the gut microbiota helps bees gain weight and be more robust, this can help inform beekeepers and help protect the honey bees' primary food sources.

Glossary:

- **Microbiome** – the community of microorganisms including bacteria, viruses and fungi, that live in, on and around a host.
- **Symbiosis** – a healthy and harmonious balance of the microbiome.
- **Dysbiosis** – a disruption of the microbiome's symbiosis.
- **Antimicrobial Resistance** – evolution of microorganisms through genetic changes to render perceived threats less powerful (e.g., antibiotics designed to kill a bacteria).
- ***Serratia*** – an opportunistic bacterial pathogen that is part of the *Enterobacteriaceae* family. BC

Killer Bee Honey

Abu **Bakr Ladd**

African Bees Make Honey From Magic Trees

And thy Lord has inspired the bee saying, ' Make thou houses in the hills and in the trees and in the trellises which they build. 'Then eat of every kind of fruit, and follow the ways of thy Lord that have been made easy for thee'. There comes forth from their bellies a drink of varying hues. Therein is a cure for men. Surely, in that is a Sign for a people who reflect.
Holy Quran Chapter 16 vs 69-79

A few years back, I rode a small 150cc motorcycle from Ouagadougou, Burkina Faso to Dakar, Senegal. Somewhere in Mali I wanted to get some water from a local water pump that was surrounded by a goodly number of bees. These bees were not very large and did not seem particularly aggressive as the local people went to fetch water and the bees did not seem to bother them.

So when I approached the pump and started the pump handle, one bee landed on my arm, I just wanted to brush it off and as I did so, it stung me. The pain was pretty intense, but bearable and I thought it would abate after some time. However, the arm began to swell and by the next day, my arm was swollen considerably and the area of the bite, extending perhaps five to six inches from the original sting site was very hard and very painful. This was my first encounter with African bees. I used the word "killer" in parenthesis to indicate that the word has to be taken with a large grain of salt.

The bees are harmless and will go about their business and co-exist peacefully with humans – unless provoked! You can see my friend Daouda Tamba handling them as they drink water and he is holding a half eaten mango which the bees are also enjoying. In short, these bees are like any other bees and will not attack humans under normal circumstances. The fact that they will inevitably wipe out the local bee population is a given, so long as the current climate change that is taking place continues northward. Of course there are still people who doubt that a climate change is occurring and evidence to the contrary will not persuade them otherwise. But I digress.

Of course when provoked, that is where the problem becomes not only serious, but life threating and in most cases will result in death.

My friend in Senegal, Daouda Tamba, is quite familiar with these bees and explained to me in great detail how the bees operate.

When threatened or alarmed, the bees give off some type of signal which alarms the hive and they spring into action. If the danger comes from a human being they will of course sting the person, but the majority will circle around his head. The person will be running for his life and the sound of dozens or more angry bees swarming over your head is something that cannot be explained but has to be experienced to be properly understood. Not many have survived to tell of the experience, although some few have.

Eventually the person running will exhaust himself, and by eventually we are not talking of a very long distance. A few hundred yards at best, keep in mind that the person is continuously being stung. As the person collapses and falls down the swarm above his head will attack his nose, eyes, lips and neck. Within 30 minutes to one hour this person will suffocate due to the intense swelling of his nose and mouth.

My house built from mud bricks, powered by two 140-watt solar panels and two 150-amp hour battieries.

KEEPING BEES IN THE KINGDOM OF THE WEST

Melanie **Kirby**

Morocco's Beekeeping Is Similar To Our's, But Their Culture Is So Different.

I've never been to this part of the world. And I had no idea what it would be like. I thought to myself, "Well, it's July and the supers are on the bees. I would like to help. So yes, sign me up. I'll go to the Kingdom of the West to share information with Moroccan beekeepers!"

The invitation to travel to the jewel of north Africa originated with a newer beekeeper named Rachid El Khazerri. Though his original roots are Moroccan, 25 years ago he established his American roots in Houston, TX. Mr. El Kharrazi is a trained emergency room nurse. His long hours and intense profession assisting with one crisis after another helping to stabilize and save lives needed a more pacifying counterpoint. He and his wife Nora, who is also an emergency room nurse, decided to buy some agricultural property as a place to develop away from the hustle and bustle of their dramatic medical professions.

And like many folks who are lucky enough to have a piece of land to call their farm, he needed to keep it in active agricultural status. Being that his work hours are not conducive to keeping livestock that needs daily care, Mr. El Kharrazi began to research what he could grow on his farm. After much consideration, he decided to take up beekeeping. He knew that he would need to do some homework before getting his own bees. Lucky for him, his wife Nora was also interested in the craft of keeping bees and she enrolled in the Texas Master Beekeeper Program.

Mr. El Kharrazi, Rachid- speaks English and Arabic. And while his English is fantastic, he decided that learning tutorials online were easier for him to comprehend in his mother tongue of Arabic. So he began participating in online Moroccan beekeeping forums. As he began to learn about beekeeping, he recognized that his home countrymen could benefit from technical assistance. And this was the start of his vision to connect Moroccan and American beekeepers to share information and learn from each other.

For those unfamiliar with Morocco, it is situated on the northern ridge of Africa and is geographically characterized by a lengthy coastline along the Mediterranean Sea and the Atlantic Ocean, with the rugged Atlas and Rif mountainous terrains surrounded by immense tracts of desert. It is between Mauritania and Algeria, directly south of Spain across the Straits of Gibraltar and includes Western Sahara.

Morocco's mystique is palpable; weaving a mosaic of ancient cultures and traditions with exotic spices,

Morocco bee team.

Mr. Brahim Benomar's family and traditional welcome meal.

Me, and some of my helpers.

These bees are known to have killed horses, cows, oxen, and goats when somehow these get in the way or have provoked a nest.

It is also not a good idea to swat at individual bees, as they give off a odor in death which signals alarm and will bring other bees to come to their aid and attack. Everyone knows that bees have an uncanny system of communication which tells the other bees where the water supply or good nectar is located. This same system informs them where the enemy is and they will come to attack the source of the danger communicated to them by their dead comrade.

A few years ago, in Bignona, in the Cassamance Region of Senegal, a local person brought us four buckets of honey. Within minutes of his arrival with the honey a single bee entered the house through one of the windows. After five minutes of the first bee, there where dozens of bees in the house. You can believe that we were alarmed because pretty soon the house was swarming with bees. My friend Daouda cautioned me not to strike or try to swat any bees. And there was definitely some fear in his voice and manner. He carried the buckets into a foyer that could be closed off and pretty soon the bees left the sitting room that we were originally in and migrated to the foyer. However bees were still coming. We had to leave the windows open so that after making their inspection and finding out that there was no longer any honey, or perhaps they had been informed that the honey had been moved, they no longer came. The other saving grace is that before sunset, they depart to return to their hive. We worked all night to clean the buckets, remove the honey, mopped the floors and did our best to remove all traces of honey and sealed the stored honey in a room with sealed lids and a locked door.

The bees came back early in the morning, but not being able to find the honey they departed after some time.

Here, I think it appropriate to tell a little about myself and my interest in bees and honey, and in particular African Honey Bees. You noticed, I hope, that I said "honey" bees and not killer bees. I would posit that these African Honey Bees are the original bees and retain within them all of the genetic traits that made them successful in their original environment.

That fact that these bees are more aggressive may well stem from the environment from which they evolved. There were infinitely more enemies and prey in the jungles and savannahs of Africa than in the fields of Europe. Naturally, this required a defense which would fight off even the most aggressive and larger animals, and all manner of other critters that love the sweet taste of honey.

I have always been an adventurer of some sort or other, mostly during my younger days when I hitchhiked to India from Germany and from The Gambia to Europe across the Sahara desert. Needlessly to say, I have hitchhiked all across the U.S. from Missouri to California and North to Canada and South to Mexico. Why hitchhike you ask, well I never had much money and the burden of getting bogged down in some remote place with no spare parts seemed to much of a burden to me. Also, when you travel on foot, you meet the people and become intimate with the country that you otherwise could never do. Staying at the Holiday Inn in Marakesh is not the same as staying in a shepherd's hut in the high Riff Mountains.

After retirement as a "handyman," that's what my wife claims I am, I decided that sitting in front of the TV getting fat and stroking out was not for me. So I volunteered to work with an organization called Humanity First. These good people provide a range of services in the U.S. as well as in many countries in Africa and Asia.

I volunteered to serve in Senegal where I built a small house mostly out of mud and indigenous materials and ran it off of two 140 Watt Solar Panels and two 150 AmH batteries. I also had a 250 Watt panel to run a DC Submersible Lorentz pump that supplied water from my hand dug well. (I didn't dig it, a local contractor did) I had a few chickens and a small garden and the idea was to show local people how to maximize their available resources.

In short, my main effort was to improve the economic condition of the local villagers. I won't go into detail to explain how poor these people are – unless you have been to some remote villages in West Africa you cannot understand. The struggle to eat everyday is real. Amazingly, prior to the advent of the Europeans arrival, food was no problem, but due to the machinations of the IMF, now people buy imported rice instead of growing their own. Money is now the most important thing and of course people do all sorts of things to earn enough money and the young people aspire to become taxi and truck drivers and to own motorcycle "taxis" instead of farming. Everyone has a cell phone and slick Chinese clothes with designer labels.

In the search to find a way to increase the productivity I came across the local honey of the Cassamance.

Sharing a mango.

In Abdullah's breeding apiary I got to experience the gentle nature of Apis Mellifera Sahariensis. *Their heat tolerance and serene productivity were impressive.*

Exquisite monofloral and multifloral Moroccan honeys.

cuisine, and arts. It is a country whose cultural cornucopia is a blend of indigenous Berber, Sub-Saharan African, Arab, Spanish and French influences, and more. It has an evolving history that goes back to the beginning of time.

Interestingly, mitochondrial DNA studies discovered a close link between indigenous Berbers and the Sami of Scandinavia (the northernmost indigenous peoples of Europe). The Sami people are indigenous **Finno-Ugric** reindeer herders who inhabit the **Arctic** parts of Kola Peninsula of Russia, Finland, Sweden and northern **Norway**. While the Berber have been known for their nomadic camel herding.

The Berbers are a diverse people whose history is more than 4000 years old. Calling themselves *Amazigh,* the proud raiders, they fought against the Romans, Arab, and French invaders. Though their language is primarily oral in nature, their writing system is over 2500 years old. They have been called many names. The medieval Europeans called them Moors.

The Moroccan people, and their culture is very reverential. Their capacity to see themselves in one another, as a people blessed to experience life, is paramount. Mr. El Kharrazi's Moroccan Muslim heritage encouraged him to share with his fellow countrymen. As his interest in beekeeping blossomed, he became inspired to organize his first American-Moroccan apiculture ambassador exchange.

To Mr. El Kharrazi's advantage, he still has a large extended family in Morocco. One of his siblings, Mr. Brahim Benomar took interest in assisting his younger brother to coordinate the first technical outreach. And since Rachid was still new to keeping honey bees, he knew that in order to educate others he would need the assistance of skilled and experienced American beekeepers.

Mr. Benomar and Mr. El Kharrazi's brotherly bond is what positively manifested this first excursion. While Rachid was stateside researching which American beekeepers to invite to teach workshops in Morocco, his brother Brahim handled the logistics of interviewing and selecting various Moroccan beekeepers and groups. He also coordinated lodging and local transportation, and facilitating events to expose visiting Americans to the diverse beekeepers and cultural traditions of the majestic Moroccan people.

For this initial trip, Mr. El Kharrazi invited me to teach queen breeding and rearing concepts, Tara Chambers of TwoHivesHoney.com based in Austin, TX to teach hive product marketing, and a Jordanian bee epidemiologist. The epidemiologist was unable to travel at that time, so our small group met in Houston and travelled together. We had a layover in Paris so we ventured onto the train to sightsee and get to know each other a little better over a café lunch near Notre Dame. Our travel that evening would, like the famed magic carpets of the Arabian deserts, fly us over the Iberian peninsula of Spain to the northern tip of Africa.

We arrived that evening in Morocco's capital city of Rabat and were taken for a late night welcoming meal with Mr. Benomar's family. His wife and son greeted us kindly and ushered us into their lush living room which was covered in richly designed Arabesque styled upholstery and ornately carved ceiling. We were served the most delectable treats along with the national drink of hot mint tea while we shared a little about our backgrounds.

By now it was after midnight and we were nine hours ahead of standard mountain time. Tara and I were then taken with our content stomachs and blissed out taste buds to Rachid's airbnb apartment across the river in Rabat to Sale. His brother Brahim graciously manages several airbnbs for him scattered around the country. Both the brothers were gentlemanly and respectful; informing us that they would be returning to Mr. Benomar's house to stay with his family. Once we were situated at the apartment, they returned to Brahim's house and left us to sleep off our jet lag until the following day.

We slept until after noon the first day and found a lovely café below the apartment which served aromatic olives with every dish. The following day, Brahim and Rachid came to pick us up in Brahim's Euro-stylish Peugot. We drove to Azrou which is a village in the Atlas mountains where we visited with beekeepers who do everything from honey production to queen breeding. We had been told by Rachid that beekeepers in Morocco tend to work their bees at the night, when bees are supposedly tamer. Distant memories of when I was a U.S. Peace Corps volunteer stationed in Paraguay, South America surfaced. Would I have to use an extra large smoker and be chased out of the apiary? I would soon find out just how different this experience would be.

Our visit this particular day was not in the middle of the night but in the middle of the day on a hot and bright mid-Summer July day. We first went to the Azrou agricultural station and were escorted to the apiary up a winding road passing through portions of what looked like a mix of savannah grasslands with quarry filled worn mountains. It was definitely not the rainy season as

An African sunset.

Cassamance is a region of Senegal which is more tropical than the mostly arid North. Neem and Moringa trees and others which I cannot name are in abundance and it is from these trees that the bees gather their honey.

The verse from the Holy Quran which I have quoted has specific and esoteric meanings. But what is clear is that according to the Holy Quran the drink that comes from their bellies has a cure for humans. Interestingly, the West Africans do not buy this honey to merely sweeten their tea or coffe, but rather see it as a medicine for a variety of ills.

According to the Neem Tree website: Although relatively unkown in the U.S., Neem is a cornerstone of the ancient Ayurvedic health care system and is one of the most widely used medicinal herbs in the world. Americans, however, are more likely to recognize Neem as an EPA registered pesticide that's non toxic and has no adverse effects on beneficial insects, including bees.

I have first person testimony from people who claim that Neem cures all sorts of ailments and Neem oil, and Neem plants are used for many local remedies. The honey produced by the bees from the nectar of the Neem trees is quite strong and has a taste that most Americans will be unfamiliar with, however, no one who has ever tasted Neem honey will deny the immediate impact that a spoonful of Neem honey has.

Which brings us to the Moringa tree. The botanical name is *Moringa oleifera*, but in West Africa it is better known as "Neverdie." That is, if you use the leaves and roots of this tree you will never die, or at least live a very long life.

There are many claims for Moringa, but most agree that Moringa has 7X the vitamin C of Oranges, 4X the Vitamin A of Carrots, 4X the calcium of Milk, 3X the pottasium of Bananas and 2X the protein of Yogurt.

Please do your own research on these incredible trees and once you have done that you will better understand the verse from the Holy Quran quoted above.

They say that it is not polite to discuss Sex, Politics or Religion in polite company, but whoever said that is a fool. These are the issues that LIFE is about. Indeed, I would claim that it is most essential that these issues are discussed. My point is that the so called African "Killer" bees are immigrants just as the Africans, the Mexicans, the Ukrainians, the Pakistani and Indians and all the rest, are immigrants. They are and will be a fact of life, regardless who likes it or not. You can no more wipe out the millions of Immigrants in this country than you can wipe out these so called killer bees. They are here to stay.

A National road to Dakar.

As previously mentioned, the obvious climatic changes are pushing these bees further Northward and to the West. The real question is how will we co-exist with these bees and how can we take advantage of their many beneficial properties which some Great Beekeeper in the Sky has ordained them with?

In the final analysis, these are political questions. Will the American people continue to elect officials into office who are detrimental to the land and Nature? These are political choices of the people of America. The continuation of an Agricultural System that poisons and pollutes the land and produces bland, tasteless food that has no saving grace, except that it travels well is nothing short of insanity. Here, in Saint Louis the Cancer Hospital is growing by leaps and bounds and when you ask the learned Doctors where is all this cancer coming from they shrug and say that they don't know. Physician – Heal Thyself!

Let me conclude by making what I believe is the only obvious and logical solution.

We have to learn to understand the language of the honey bees and their nature and live in harmony with them. They will provide us with many benefits. As someone said, you would not want to haul flatbed loads of them up and down the highways. If you stop poisoning the land, the indigenous bees will come back and eventually mate with the local ones and the problem will be solved.

The other thing is that since the U.S. is now importing more than 180 million kilos of honey per year from other countries, and as this number is only likely to grow, you might consider importing some of this wonderful honey yourself and reap the health and financial rewards that this honey brings. BC

Azrou beeyard in Atlas Mountains.

The author.

Agadir beekeepers.

the grass was dry and sun bleached. We stopped briefly to visit one of the King's national aquaculture program ponds then continued to climb in Mr. Benomar's stylish Peuogot up the mountain paving the way for cross cultural educational bee workshops.

I wasn't sure if I needed to suit up completely or brave the elements. So I decided to take pictures first and watch the beekeepers approach and enter their hives. This particular apiary was full of short spiny, desert tolerant plants. The bees buzzed to and fro gracefully. And as if on cue, I mustered my inner courage, and was determined to work through these hives as graceful as I could.

I am used to not wearing gloves since becoming a queen breeder, so it slipped my mind to put some on. I also forgot that I didn't have a veil on since I had been taking some pictures so I absent-mindedly ventured forward without a veil and no gloves. One of the Moroccan beekeepers noticed and told Mr. Benomar and Mr. El Kharrazi, who also served as our translators. The bees were relatively calm and it wasn't until they mentioned it to me that I realized I had handled several *Apis m. meliffera* and *Apis m. intermissa* hives without the expected protective gear.

I asked Mr. Benomar to translate for me and shared with the beekeepers that it had just slipped my mind. I didn't want them to think that I was purposely reckless. Given that it was a hot day and there wasn't a nectar flow, we were all overcome with the bees' seemingly pleasant natures. One of the beekeepers, who had been keeping bees for 30 years decided he would take his veil off – asking for a very quick picture before he lost his courage. He did not get stung – none of us did that day.

After poking through a few hives and looking for queens (which were dark colored), we stood by the vehicles and talked shop over chunks of oozing and divine comb honey. And thanks to Mann Lake ltd. who donated some queen rearing supplies, I was able to gift each of the beekeepers with a spring action grafting tool and some JzBz grafting cell cups and queen cages. The beekeepers were thrilled to learn about American queen rearing techniques. And I was thrilled to learn about their efforts to preserve their endemic honey bee strains and Moroccan migratory honey production.

Our trip continued to expose us to all sorts of delights- both in and out of the beeyard. We travelled to Marrakech and visited several souks (markets). We enjoyed the national dish – couscous, which his customarily eaten with one's right hand. And also got to experience a hammam – a bath house where for a small fee, one can be scrubbed with special soaps and oils. And of course, we perused stands, and aisles filled with exquisite varietal honeys, including origan (oregano), jujube, rosemary, eucalyptus, citrus, and desert wildflower.

We met our second group of beekeepers near Agadir, which lies to the south. Here we were invited by Abdullah and his family to visit his apiary in a copse of fig trees. He is an aspiring bee breeder and was thrilled when I gifted him another set of queen rearing supplies donated from Mann Lake, ltd. He shared that his dream is to learn instrumental insemination so that he can better preserve his area's endemic strains.

We then ventured on to visit several additional towns. Sadly, our hosts had a family member pass away during our last few days so Tara and I decided to head to Tangiers to occupy our time and to respectfully allow our hosts some time to tend to family matters. We had a fantastical time in Tangiers meeting other tourists and Moroccans. I got to speak Spanish which was helpful in that my French is limited- though I love trying. We visited Chefchoua, the Blue City – which is where I found local beekeepers selling their exquisite honeys next to a waterfall and in the town center.

The bees were quick to find the sweet rolls and pastries in the bakery shops. Patrons did not seem phased to see bees swarming the sticky sweet rolls. In fact, it became a testament to the pastry shops – if the bees were attracted, then it must be good stuff. And indeed it is. Morocco is a delight. It is sophisticated, historical, colorful, flavorful, and bountiful. The bees in these enchanting lands have adapted to such diverse and adverse landscapes. As have the beekeepers.

Efforts to coordinate additional technical exchanges is underway. Mr. El Kharrazi and his brother Mr. Brahim Benomar have begun discussions with the Moroccan government to host additional trainers and to include researchers with American and Moroccan universities. I truly hope they are able to continue these cross cultural and technical exchanges. I dream of returning and learning more about their native honey bee breeding programs and eating more delicious honeys. BC

Melanie has been keeping bees for 20 years, first starting as a Peace Corps Volunteer in South America. She serves as an international consultant on sustainable beekeeping and is an avid writer and consilience researcher. She can be reached at ***ziaqueenbees@hotmail.com****.*

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[1]Charistos, L, Parashos, N & Hatjina, F (2015) Long term effects of a food supplement HiveAlive™ on honey bee colony strength and Nosema ceranae spore counts, Journal of Apicultural Research [2] Increase in honeybee populations with continued use of HiveAlive™, Results from long-term field trials, France 2014-2015, Trial conducted by Véto-pharma, France.

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Asparagus.

Some For You, Some For The Bees

Janet **Davis**

Herbs have been grown for honey bee forage for millennia, ever since ancient Greeks and Romans learned the fine art of beekeeping. In Book IV of the "Georgics" (29 BC), Virgil recommends the ideal spot for an apiary.

"Let green rosemary, and wild thyme with far-flung fragrance,
and a wealth of strongly-scented savory, flower around them..."

Today, gardeners know how attractive a herb garden can be to honey bees, with even more choices of culinary or medicinal herbs to grow for nectar and/or pollen.

Similarly, certain plants grown for their edible leaves, stems or roots also bear flowers that bees love. In vegetable terms, this is sometimes called "bolting", an old English word used to describe how a plant grown for its vegetative parts ultimately flowers and produce seeds. Though bolting might not be every vegetable gardener's objective, the bees will appreciate you for it. So if you have a veggie patch or herb garden, consider letting some of these edible plants flower. In fact, why not grow some for you and some just for the bees? And, of course, remember that you need *lots* of one type of plant to encourage scout bees to add your garden to the colony's foraging map – one little dill or mint plant is not going to work.

Asparagus (*Asparagus officinale*) – Seasoned asparagus gardeners know that once you've harvested the thick spring shoots from your mature (three years+) asparagus patch, it's important to let the thinner spears, stems and leaves keep growing to photosynthesize and nourish this perennial so it thrives. Honey bees are very fond of the bright orange pollen on the tiny, yellow male flowers and perform elegant acrobatics in order to harvest it.

Basil, sacred, Tulsi (*Ocimum tenuiflorum*) – This aromatic annual has seen its popularity as a container annual soar, not just for the traditional Indian 'tulsi' tea made from its aromatic leaves, but for the long-blooming spikes of purple flowers that are irresistible to all kinds of bees, including bumble bees, tiny sweat bees and, of course, honey bees. Sacred basil likes rich soil and needs at least four hours of sun to thrive, but will take some afternoon shade. Pinch the stems to encourage bushiness and watch the bees come.

Basil, sweet – (*Ocimum basilicum*) – Tiny, white sweet basil flowers can be used in recipes just like the leaves, but if you snip them you'll be depriving honey bees of a taste treat. Sweet basil likes rich, adequately moist soil and prefers some shade from hot sun in mid-afternoon. (Another popular culinary basil, African blue basil is a cross between two *Ocimum* species and is also very popular with honey bees).

Broccoli, Kale, Cabbage (*Brassica oleracea*) – It shouldn't be a surprise that letting your broccoli, kale or Swiss chard plants go to flower is a good way to nourish honey bees, since related *Brassica* crops like mustard and

Sacred Basil

Broccoli

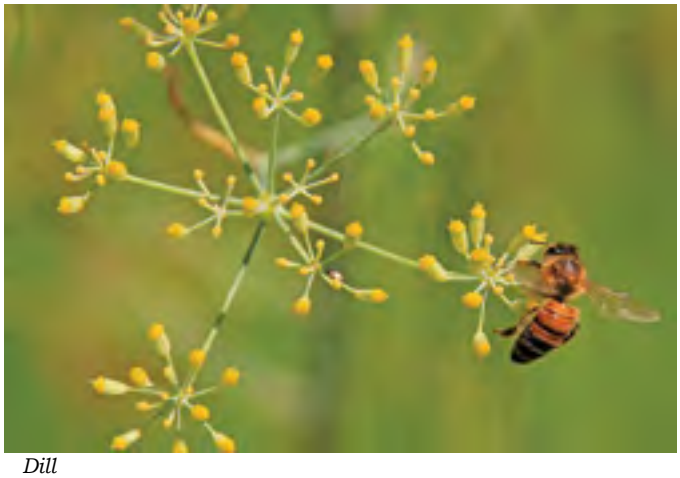
Chives

canola (rapeseed) are often pollinated by bees managed by commercial hive operators (though canola honey is fast to crystallize, thus often turned into cremed honey).

Chives (*Allium schoenoprasum*) – Not only do perennial chive flowers look lovely in the garden and in bouquets, they're also a boon for honey bees and bumble bees– and you can still snip the leaves for your smoked salmon bagel or baked potatoes. Honey bees also enjoy the white flowers of garlic chives (*Allium tuberosum*) which is often planted as an ornamental perennial.

Dill – (*Anethum graveolens*) – Did you know that in parts of Italy, they make a honey from dill? While you might prefer dill pickles to dill honey (amber to brown and quick to crystallize), letting your dill plants flower will keep honey bees happy. And those airy, yellow dill blossoms look divine when planted amidst colorful Summer annuals like bee-friendly single zinnias!

Mint – (*Mentha* sp.) – Just as with dill, there's a mint blossom honey made in Piemonte, Italy called "miele di menta". Spearmint, peppermint, apple mint – they're all favourites of honey bees and easy-to-grow perennials. In fact, mints can be very invasive, and some prefer growing them in containers. Letting the plants flower will bring lots of bees, and you can still harvest the leaves for mojitos or mint jelly,



Dill

Oregano – (*Origanum vulgare*) – An excellent, hardy perennial herb with umbels of tiny white or pink flowers that literally buzz with bees in mid-Summer, oregano is easy to grow in regular soil in a sunny spot.

Radish (*Raphanus sativus var. radicula*) – Like other brassicas, common (annual) radish is very attractive to honey bees, but bumble bees and natives seek out the open, easily accessible flowers too. Flowers form after the roots reach an edible size, in response to warm summer temperatures.

Rosemary – (*Rosmarinus officinale*) – Another good shrubby herb that honey bees adore, rosemary prefers sunny, relatively dry conditions that mirror its native Mediterranean habitat. In milder parts of North America, it will overwinter and become quite large, depending on the variety. In Italy, honey bees that forage rosemary crops yield a honey called "miele di rosmarino".

Oregano

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Radish

Spearmint

Sage – (*Salvia officinale*) – All sages attract honey bees, including European meadow sage (*S. nemorosa*), California black sage (*S. mellifera*) and bee sage (*S. apiana*), but common sage has been popular with beekeepers since medieval apothecaries kept it in the "officina" or herb storeroom to be used to "salve" or heal various ailments. The light purple flowers with crimson calyxes are beautiful, and are very attractive to bees. Unsurprisingly, beekeepers in the Abruzzo region of Italy make a monofloral honey from common sage flowers called "miele di salvia".

Thyme – (*Thymus vulgaris*) – Common thyme is another ancient southern European herb grown for its aromatic leaves and mats of purplish-pink flowers. A hardy perennial, it's often seen in sunny, dry spots in gardens in a lush, fragrant carpet growing between paving stones. A more tender Greek plant, wild thyme (*T. capitatus*), growing on Mount Hymettus near Athens, yields the iconic Hymettus honey, which Greeks typically use to sweeten yogurt. In *Midsummer Night's Dream*, Shakespeare's Oberon, king of the "faeries" said: "I know a bank where the wild thyme grows". If he'd looked closer, he might have seen honey bees nectaring in those tiny blossoms. BC

Thyme

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Beeyard Thoughts, Observations, and Updates

Robbing or swarming?
A couple of things that I feel I need to say.
Odds and Ends – Hot bees and thick honey.

When is it robbing and when is it swarming?

I wrote last month that I had gotten two free swarms this season. They came to me from points unknown. As of yesterday, I can add a third swarm to my season's collection. That's three last year and three this year. Before last year, I got maybe a single swarm every two-three years. I don't know from whence they come, but I am happy to get them *(Except for the cranky one I wrote about last month. More on this later in this piece.)*. I am aware that some of you get 20 maybe 30+ swarms per year. I don't, so these free bees have been exciting for me.

I was performing normal bee yard work a few days ago (May 27th) when I heard what sounded like a WWII bomber squadron flying overhead. Of course, I only know what old plane engines sound like from years of war movies. I live near the local county airport. Periodically, some strange machines fly over my house.

I positioned my hearing aid-assisted head and quickly realized that the sound was a swarm approaching my apiary – at that very moment – arriving in the air above me. I feared that it would do the usual swarm thing and cluster sixty feet above the apiary just to taunt me. Nope. With pinpoint accuracy and much like a 747 gliding in, the swarm zeroed in on a short stack of empty equipment. The stack was very close to other established colonies. This had to be a precision landing for the swarm. It was.

Just a couple of weeks ago...

About two weeks ago, I noticed robbers around this same stack of equipment and noted that the nectar flow was weak. While observing these "robber bees", a swarm landed with great fanfare in the empty equipment. I took a humbling moment to reflect that I had confused robbers with swarm scouts.

This first swarm stayed hardly three hours. Off they did go, again to points unknown. Bummer. The very next day, there were several tens of bees checking out the abandoned equipment busily coming and going. Aha! These must be scout bees reconnoitering the site in preparation for the swarm's return. It didn't come that day, or the next day or even the next week. Yet there were bees checking it out all the time. A different equipment stack had bees coming and going leaving telltale wax cappings signs that it was truly robbers. Second bummer. There were other signs around my apiary that robber bees were up to neighboring colony malfeasance.

Robbing, just beneath the surface of apiary normalcy, was all around me. I reflected that the swarm season was over and that the robbing season was clearly under way. That's nearly exactly when the bomber sounding swarm came in to occupy the empty equipment – for the second time. I have no way of knowing if it was the same swarm. It had become very plain to me that it is difficult to determine swarm scout bees from robber bees when both kinds of bee are at the same job site.

I'm comfortable saying that they mix within the hive equipment of interest. As the swarm landed, brouhaha broke out between swarm bees and robber bees – both wanting the same nest site, but the robbers were quickly ousted.

It was a highly educational episode for me for I was no part of the event. My only role was stacking empty equipment in order to photograph my apiary for you. The stack was not meant to be a swarm trap.

In preparation for a future discussion with you about queen

Guards, robbers or scouts? Each one means something different to the beekeeper.

This large swarm easily overpowered the robber bees. No contest.

prices and queen introduction, I had established two very small nucs into which I released my pricy queens. It was, and continues to be, a beautiful plan.

As the robber/swarm situation resolved itself and as I was feeling good about all things in my beeyard, I strolled to review the two nucs. They were under full attack from robbers. It was bee chaos. I closed the nucs up and moved them 60 yards away. I found, to my great relief that I had caught this situation before the queens were killed. Good grief – what else can happen in this beeyard on this day?

As the afternoon passed, the swarm stayed put, and the nuc robbing stopped. Bee things returned to normal – except for several hundred roaming bees that lethargically drifted about the yard. These disoriented bees did not appear to be on robbing missions. The scenting at the swarm entrance had been greatly reduced. I ask you, were these lost bees separated from the swarm? What was their ultimate fate?

Bottom line...

Based on this single observation alone, I could not tell the difference between swarm scout bees and initial robber bees starting to loot. I'm sure that later on, the robbing behavior would have become very obvious.

A couple of things...

Long before beekeepers were fretting about nectar sources, bees were thriving and readily visiting a variety of plants that are now designated as *weeds*[1]. Well, now we certainly can't have *weeds,* so industry has developed some very admirable weed killers to meet our needs. Hypocritically, even this season, I used some of them on my front lawn. I used them because my neighbors used them, and I don't wish to be *"that house"* in the neighborhood.

Presently being in the process of disposing of my parent's property, I have become hyper aware of the concept of *property value* and how it is affected by *appearance*. *Weeds* do not impress potential buyers – even if they are flowering and are benefiting pollinators. Ergo, I kill *weeds* on the parts of my property that show in order to fit in with the rest of my neighborhood. No, my property is not presently for sale, but other properties in my neighborhood are on the market. No matter what direction I take, I feel guilt.

This thought thread is due to my acquisition of two BeeSmart robbing screens. I confidently told the supplier that I would not need these until July. (Today is May 31st). Well, that certainly changed. The traditional bee plants in my area are steadily passing through the annual cycle as it steadily rains every other day. My bees and I have gotten nothing.

In my bees' foraging area, clover historically has been the "big bang" nectar plant followed by both yellow and white sweet clover. Yesterday (May 30th) I had both a swarm land and two mating nucs attacked. Where I keep bees, those two behaviors are commonly separated by three-four weeks. At least that is what I was thinking as I spoke with the company representative manufacturing the robbing screen. That brings me to this point.

In my area around Wooster, Ohio, white clover is no longer a meaningful nectar plant. I have not really gotten a clover flow in years. Though we cannot kill common invasive plants, consistent and persistent herbicide use has really worn down the formerly ubiquitous white clover into near oblivion. There should be a nectar flow now, and it should be a good one. Instead, I have swarming (from previous flows), robbing, and no flow.

Bat watching and clover nectar flows

Just four or five years ago, various members of my family and I would sit outside at dusk and watch the bats come out. At any given time, there would be 10 - 20 bats swooping and darting in the darkening night.

[1]In a lost effort to be sarcastic, I have italicized the word "weed" throughout this piece. A weed is something ugly and bad – like cocklebur or sandspurs or poison ivy – right? In my own lifetime, I can easily recall when grass was the weed in flowerbeds and row crops and clover was the good plant. Clover is not a bad plant, it's just in the wrong place. Good grief – give my bees and me a break.

A clover forager. I had to convert a photographic slide for this. On the clover that is left, bees are few. Is she a pollen collector or both nectar and pollen?

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One of the few clover patches in my front yard. It is unattractive to bees.

Last night we saw two, and I suspect it was the same one making two trips. As you know, bats are currently being subjected to a disease that has killed or sickened many bats.

My daughter and her family had a novel experience when they found a bat flying around their house late one night. To their credit, they actually captured it, but read on the Ohio web page that a captured bat should be tested for rabies. It was tested, the test was negative, but the bad did not survive the test.

Just a few years ago, clover was abundant everywhere. It was a long blooming; nitrogen fixing plant no one gave much consideration. It cared for itself. Now both clover and bats are declining – one intentionally killed due to being designated as a *weed* and the other for pathological reasons. Are there management reasons that preclude clover being bred or selected as a lawn plant? I fear that decision has already been made and instituted. I hope the bat population can recover. I put out a bat box. Clover has a much better chance of recovering.[2]

The goodness and labor of pollinator gardens

I support all pollinator garden programs as much as I can. I have not a single negative thing to write about this concept. But all of these programs face serious and perpetual challenges before they become commonplace. But garden people please don't quit.

Even in my semi-retirement, I still speak to several people per week about this very topic. For instance, there is presently a retired professor who is a church member with me. His request to allow the church grass grow to a height of four inches before mowing was recently approved by the appropriate committee. Fearing the congregation would be shocked at the lawn's appearance, the committee suggested that a note be put in the church media systems explaining why the lawn may look unkempt. But the member's second request, a church pollinator garden, was tabled until next year. In the meantime, the church lawn will continue to be maintained as it was, only longer. (Ergo, no clover allowed.)

In my life, as a suburban property owner and beekeeper it seems to me that pollinator gardens and bee plantings are not like lawn maintenance. While a lawn equals a comfortable riding lawnmower and a quick job well done, a garden equals specific work and care.

Here's my point – I have bees swarming, neighbors being stung, some robbing ongoing, perpetual queen issues and six grandkids. So now I will be putting in a flowering garden that requires maintenance? Hmmm. Is this an idea for beekeepers or gardeners? I know you are going to say 'both." Okay, I going to try, but I suspect my flowering garden will be scruffy at times. The bees and other foraging insects won't mind.

Odds and Ends

Aggressive colony stinging too much

Last month, I wrote about a troublesome situation in which a testy colony was stinging both my neighbor and me. Knock on wood – I now seem to have that issue under control. I moved the two colonies to a remote 40 acre field far away from anyone. At that location, I had a thought – let things calm for a while and then determine if requeening in needed. So, for now, the neighbor issue is resolved, and if needed, queen replacement will proceed at this new location.

Extracting thick honey

Though the extracting process, about which I previously wrote, took longer than I expected, the bees did clean and move the honey. In fact, I think the bees used most of it rather than relocating it. If I do this strange extracting procedure again, I will only give a couple of open frames. I gave six to one colony. That was too much, too fast. I'm closing the file on this project. No worries. Many other topics are opening. For instance, are ants always enemies of bee colonies? Really? More later. BC

Dr. James E. Tew, State Specialist, Beekeeping, The AL Cooperative Extension System, Auburn Univ; Emeritus Faculty, The OH State Univ. ***Tewbee2@gmail.com; http://www.onetew.com; One Tew Bee*** *RSS Feed (****www.onetew.com/feed/****);* ***http://www.facebook.com/tewbee2; @ onetewbee*** *Youtube:* ***www.youtube.com/user/onetewbee/videos***

[2]I am not saying that clover is gone, but I am saying that where I live, it is greatly diminished. I still commonly see it, but not like it was twenty years ago. South of where I live is a very large Amish community. Clover is alive and well there. Additionally, there are many factors that affect pollen and nectar flows from Clover. Like fishing, bees and beekeepers must find just the right spot.

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History Of The Muth Bottle, Part 1

The first jar invented specifically for honey.

Jim **Thompson**

Charles F. Muth

I collect old honey jars and when I heard that the Muth Jar was the **first** jar to have been specifically made for honey, I had to check dates, because there were several bottles that were made for honey around the time that the Muth jar came on the scene in America. From this start, a colorful history emerged.

The one pound Muth jar is a square jar that is 6½" tall. Traditionally this type of jar was used for pickles and horseradish. Many people used a jar of this type only with the embossing of their names, so what makes it a Muth jar is the embossing of the beekeeping scene on the bottle. Therefore I will be looking at the bottles or jars from six producers or people that produced honey.

Charles F. Muth was born in Germany, April 23, 1834 to Charles F. and Carolina (Schmith) Muth. He had a brother August and a sister Carolina. August passed away in 1890 and by 1894 Carolina had married Ernest Oberheu of the Eagle Insurance Company in Cincinnati.

Charles was educated in Germany and at the age of nineteen (1853) he arrived in Cincinnati. There he clerked for three years in the grocery of S.H. Frank at the corner of Vine and Canal streets. He spent a few years in Minnesota and Kansas, engaged principally in land speculation. Upon his return to Cincinnati (1860), he established a grocery until 1883. The grocery store changed and carried the name Charles F. Muth & Sons, dealers in seeds, honey, beeswax and apiarian supplies.

In July, 1857, Charles married Carolina Muth. She was from another Muth family that were bakers by trade and also lived in Cincinnati. Charles and Carolina were the parents of ten children. The six children living in 1894 were: August J., who married Annie Nickel, and was associated in business with his father; Carolina, who married Louis W. Sauer, druggist; Henry E., who also associated with his father; Fred W., Stella, and Nellie.

During his 15 years as a beekeeper, Charles invented or improved many beekeeping items. Only one of the items was patented so the other items have been gleaned from literature.

Muth Honey Extractor

Muth Honey Extractor – a two frame extractor with a tapered basket was granted Patent 208,327 on September 24, 1878 and featured a crank high above the top of the extractor, a honey reservoir and a honey gate.

Muth Honey Knife – looked very much like the standard cold Bingham uncapping knife.

Muth Cold Blast Smoker was mentioned in Gleanings on page 190, March 1, 1886. It was a smoker having bellows made of tin. So the smoker was all tin except the leather. He called this smoker the "Perfection." It also had a valve in the bent air-tube, to prevent the smoke from being drawn back into the bellows. Another addition was a muzzle feeder, somewhat like the style on the Bingham's and the extra covering on the fire pot to prevent burned fingers.

Muth Wax Extractor – one report was that there was a Muth wax extractor, but I couldn't find it.

Muth Honey Jars – Since square jars were listed in the Root catalog in 1879 and the name of the grocery store changed in 1883, the earliest muth jars were made between 1879 to 1883. There were only a few glass companies at this time that made the square "pickle and horseradish" jars. They were Illinois Glass of Alton, Illinois, K.G.B. in Steubenville, Ohio, Whitall Tatum & Co. of Millville, N.J., and a couple of unlisted manufacturers such as" Z" and "C.C.S."

In business, Charles was a very fair man as shown by three examples.

He had made an agreement with Oluf Olson, a southern beekeeper to purchase his honey at eight cents a pound. Upon receiving the honey, Charles found it to be of exceptional quality, that he told Mr. Olson that he was increasing the payment rate to ten cents a pound.

A woman going home to Lexington, KY from a National Bee Convention found herself stranded in Cincinnati because she had been transferred to the wrong depot. When

Charles Muth found out about it, he opened his house to her and she was shown the work that was being done at the Lutheran Orphans' Home the next day.

You will read about Charles thinking of Max Talbert's order and making sure that everything was fair, while he was considering suicide.

Sometimes journalists embellish their articles, write articles without checking the facts or checking the spelling of names, putting in items that should have been left out, and not reading their own articles to proof them as there are a couple of things that are repeated. An example of this can be seen in the following article that appeared in the Cincinnati Enquirer (Cincinnati, Ohio) – Tuesday, May 17, 1898, page 12. So read the following obituary with a forgiving heart.

RIFLE

Ball Ended His Life

Tragic Death in Indiana of Charles F. Muth.

Wrote a Letter and Then Killed Himself.

Suffered From an Illness Resulting From Sunstroke.

His Property in This City Heavily Mortgaged, as Was His Farm, Where He Died.

Charles Frederick Muth, a prominent German Citizen and member of the Hamilton County Board of Control, committed suicide on his farm near Morristown, Ind., sometime between Sunday night and yesterday morning by shooting himself through the head. The news of his tragic end was a shock to his family, friends and acquaintances. He was reputed to be wealthy, his family relations were pleasant and there was apparently no cause which would drive a man of his standing to such a desperate deed.

Mr. Muth attended the meeting of the Board of Control at the courthouse last Tuesday afternoon. He took a lively interest in all of the proceedings, and seemed in good spirits. He said, however, that he was not feeling very well, and complained of pains in his head and back. The latter part of the week he announced to his family that he was going to visit his six-hundred-acre farm near Morristown. He was not feeling well then, but insisted upon going and went. On Saturday he telegraphed his family that he would be home Monday. The telegram was prophetic in a way. He arrived here last night a corpse.

On the farm is a house in which Mr. Muth stayed during his frequent visits. One of the rooms he had fitted cozily as a bed chamber for himself. About 7:30 o'clock yesterday morning James Wilkins entered Mr. Muth's sleeping apartment to call him, and was horrified with what he saw. Mr. Muth was stretched across the bed with his legs hanging over the side and his feet touching the floor.

Between his knees was a thirty-two caliber rifle, the muzzle still pointing upward at an angle, Just under the chin near the right side was a ghastly wound from which the blood was still flowing. Wilkins found that the body was warm and ran for assistance. A thorough examination, however showed that life was extinct. The bullet from the rifle had passed through the base of the brain. Death must have been instantaneous, so that the deed was committed shortly before the body was found. There were no powder stains about the wound, and this fact at first aroused a suspicion that there had been foul play, but later the conclusion was reached that it was a clear case of suicide. Mr. Muth was fully dressed when found with the exception of his coat.

He had evidently shot himself while sitting upon the side of the bed and had then fallen back to die.

All Sunday Mr. Muth complained of severe pains in his head, and seemed to be morose, a condition which was unusual for him. The employees at the farm noted this and remarked about it. When the Coroner arrived upon the scene he made a discovery which explained everything. It was a letter left by the dead man. It was apparently from this that he had made up his mind to die, and had probably come to the farm, which he loved, to bid farewell to life. He had prepared himself for the end, and had then set himself about writing the last letter which his hand was to pen. It was in three sections, and there had probably elapsed considerable time between the writing of each. The dawn was just breaking when the shot was fired which ushered him into eternity.

The letter which he left was written on a business tablet, and was found lying on a desk near the bed. It was as follows:

"If I should die on my farm it is my wish that I be buried in the same graveyard with August Muller, and in the same simple manner. My family will respect my last wish. My honest debts must be paid."

Charles F. Muth

"If my Masonic brethren of Morristown would do me the last honor it would be to me a consolation. I have always been worthy as a man or Mason to the best of my ability.

Charles F. Muth
Morristown, Ind.
May 15, 1898

"I have mailed home on Saturday the order of Max Talbert and his check for $24.00. His order will be filled on Monday or his check returned."

Muller, whose name is mentioned in the letter, was the dead man's uncle, and was buried in a neglected country graveyard, just west of the farm. Talbert is a wealthy farmer, living southeast of Morristown and he and Mr. Muth had many business transactions.

The suicide adds one more to the tragic deaths which have occurred on this farm. There had been five violent deaths previous to this, two suicides, two murders and one accidental shooting. Beyond the letter nothing was found in the dead man's room which could throw any more light upon the deed. The safe was locked and could not be opened.

The news of Mr. Muth's death by suicide was at first discredited in this city, as there was apparently no

Muth Honey Knife

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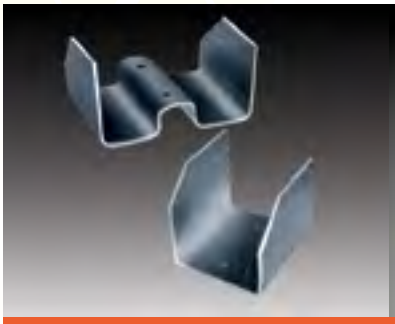

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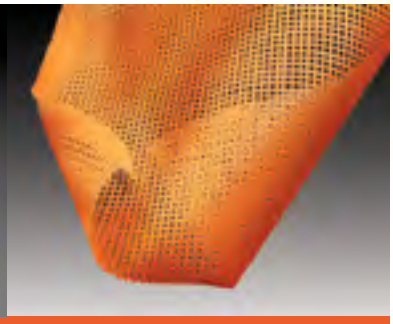

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motive for the deed. About 14 years ago he suffered a sunstroke, and later a second one. These strokes affected his health, and the general opinion seems to be that his mind was temporarily deranged when he took his life. Business reverses may have had something to do with it. He and his son were in the honey and seed business on Central avenue near Freeman, and he owned the building in which the store was located. It could not be learned positively, but it is understood, that the farm in Morristown is mortgaged for an amount somewhere between $12,000 and $18,000. It is said to be worth $35,000. He had been trying for years to sell it, but was unable to get his price, which was $38,000. It is thought that the land could not be sold by him upon account of the wording of the will by which he inherited it, but it was impossible yesterday to get at the Court records so as to substantiate this. On a portion of the farm was Blue River Park, which he leased to A RAILWAY COMPANY.

An investigation show that the dead man's real estate in this city was heavily mortgaged. He owned the big building in which he had his store on the south side of Capital avenue near Freeman. This was mortgaged on August 10, 1892 for $10,000 to the Butchers and Drover's Building and Savings Company. The mortgage has not been canceled.

He and his wife owned a piece of property on Central avenue, southeast of the old Brighton House. This was mortgaged on February 12, 1890, to the Brighton Hall Building and Savings Company for $10,000, and the mortgage has never been canceled. On the same date another mortgage for $2,000 was filed to this building company on the same property and is un-canceled. The tax duplicate fails to show any other property owned by Mr. Muth, and the listed value of this property shows that the mortgages were heavy.

Mr. Muth was appointed executor of the estate of Joseph B. Pressell, deceased. He filed his report in August of 1897, showing that he had received $16,159.05 and had disbursed the same amount. Ellen A. Chase, one of the heirs, filed an exception to the account upon the ground that the sum total of the receipts was not equal to the amount of the notes, with interest, listed in the appraisement of the estate, and upon the further ground that the executor held as a residuary fund $500, which ought to be larger.

Fanny and Emma V. Diserens, as heirs, also filed an exception to the account upon the ground that the account did not show all the receipts that should have been received, and that the expenditures showed Court costs and expenses which were improperly charged. It is thought that all of these things taken together may have affected Mr. Muth to a considerable extent.

Mr. Muth was born in Felsberg, Hessin, on April 23, 1834. He began his career as apprenticed dyer to his father, who connected himself with the firm of Henry Frank & Co., grocers. Later he left this city and engaged in the cattleraising business. He returned to Cincinnati and entered the firm of Jos. Taylor and Co., grocers, with whom he was associated three years. He then went into the business for himself. He married Caroline Muth, daughter of the late August Muth, baker. He made a fortune in the honey trade.

Last Fall he was elected a member of the Board of Control, with Geo. Weber, upon the Fusion ticket. These two men were placed there to check extravagances. The fact that the board is composed of four members gave them considerable power. The appointment to the vacancy will be made by the Common Pleas Judges, to hold until the Fall election, then the people will have a chance to elect a man to fill Mr. Muth's place. Mr. Muth was a prominent German citizen.

He was President of the National Association of Beekeepers of the United States and Canada for years, was a Director of the Workhouse, was President of the German Orphan Asylum, member of Hanselmann Lodge, Masons, and a trustee of St. John's Church. There survive him his widow, his sister, Mrs. Ernst G. Oberlien, and six children, August J., Fred W., Henry E., Della and Nettie, and Mrs. Louis Sauer.

Mr. Muth paid weekly visits to his farm. He had been ill lately, and his family objected to him going there Saturday, but he insisted upon going. He lived over his store on Central avenue. When the news of his awful death reached his wife she was

Original Muth type jars

prostrated. Members of the family at once left for Morristown to bring the body to Cincinnati for burial. Mr. Muth had suffered two sunstrokes during the past few years and these were responsible for his poor health.

There will be no meeting of the Board of Control today, and the office will be closed. It was shut yesterday and crepe put upon the door. The courthouse flag was also placed at half mast.

Mr. Weber, of the Board of Control, was sorrow-stricken over the death of his colleague in the board. When he heard of it he went to the courthouse and found President Bauer, of the board, giving orders about draping the office with crepe. The two men are not on good terms, and argument arose, which was heated, to say the least. Mr. Weber intimated that Mr. Bauer was not sorry, from a political standpoint, for Mr. Muth's death, but before the talk led to something else the men separated.

The body of the dead man reached this city last night in charge of his family. Arrangements for the funeral will be made today." BC

Jim Thompson is a long time beekeeper and beekeeping historian living in Smithville, Ohio.

In Part 2 we'll examine the history of Muth, and similar jars in the honey industry.

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Converting Customers To Cremed or Granulated Honey

Howard **Scott**

Make more money. Work less.

In the market shelf these days, I see more and more cremed and crystallized honey. There is Really Raw Honey, the Baltimore, MD packer that only sells unprocessed, unstrained honey. In addition, many stores offer local offerings of the solid variety. In fact, the solid product is often sold at a premium price. Such a market trend should get you thinking about converting your customers to cremed honey.

Cremed honey is simply liquid honey that has crystallized, almost all honeys do, but the size of the resulting crystals are controlled so the honey is smooth as ice cream. Some honeys crystallize this way naturally, some form large, course crystals.

After all, selling cremed (or solid) would certainly make life easier, save time, and reduce monitoring effort. Cremed honey is the natural state, or at least its ultimate composition. It would be easier to stock one item rather than two. Moreover, liquid honey that is turning looks bad. Floating particles combined with hulking stalactites festooned to the edges gives the product an eerie look. Partially crystallized honey looks dirty, as if the beekeeper didn't care about his product. With cremed honey, one wouldn't have to worry about such appearance. Furthermore, a seller of cremed honey doesn't have to worry about bottles going bad over the Winter. Finally, the less one heats honey, the more healthful it is. Here, then, is how you might try to convert your customers to cremed honey. Even converting a portion of them will make your life easier. Read: you'll make more money.

• The presentation. Hold both containers and ask which the customer prefers. Perhaps hold the cremed bottle farther out, closer to the buyer's hand. The customer might ask, "Which do you prefer?" You state that it doesn't make any difference, that it is a matter of taste. You might want to go into why cremed honey is a more natural state. Furthermore, you point out that it is easier and less messy to spread on toast. As far as using in liquids, it dissolves just as rapidly as liquid honey. Finally, you go into why you enjoy the crunchy taste of solid honey.

• The personal solicitation. You state that you prefer cremed honey, and state your reasons. But go into them with more detail. What I do is talk about the less messiness. I might say this: "Every morning, I lather honey on toast. In the old days, my fingers would get so gunked up that I needed half a dozen napkins and had to wash my hands at least twice every meal. Now, cremed honey smoothly spreads on toast. It never drips or spreads. There's never any sticky spots on the floor and traipsing through the house creating smudges. I eat the toast in one sitting, use one napkin, then I wash my hands. It is so much easier. Plus, I prefer the taste of those granules. I get both the taste of aromatic honey, with the texture of crunchy peanut butter."

• The combination offer. When someone wants four or 10 jars, offer one cremed and three liquid or two cremed and eight liquid. When the customer asks about the different offering, go into your arguments. Cater your answer to what you think the customer wants to hear. For example, if you know the customer is a health nut, emphasize that cremed version has its essential healthy properties intact, that is, the enzymes that the honey bees deposited in the nectar are still there, and still radiating health and vigor. If you thought the customer enjoyed the taste, suggest that she should try the same item in a different form.

I have half a dozen regular customers that order six to 10 jars at a time. To date, I have converted half of them to the cremed variety by the above approach. Getting someone to try the new item is half the battle. As far as storing both varieties, it's no problem. I maintain containers of both varieties. So it's not really carrying two product lines.

• The natural process argument. All honey granulates. This is a fact of life. I point out that cremed honey is the more natural state, because that is the composition it becomes. This argument often gets the customer to try the product. "Natural" seems to ring somewhere in their consciousness. Somehow the designation confers more legitimacy onto the product and less of a step child. Make

the argument that honey sitting in cupboards naturally tends to granulate and excessive heating is bad for the product. I point out that such heating could destroy the health-inducing enzymes of honey. So if you have to re-heat the product two or three times, you could lose some benefit. That argument gets me into trouble because the customer comes at me with pin-point logic: "You mean you kill all the healthy enzymes whenever you liquefy honey? Then, if your local honey isn't better for you, I might as well buy supermarket product, and pocket the extra $5 I would have spent." Of course, I point out that we don't heat to above 100°, while supermarket variety is batched at 160 degrees.

• The price advantage. I offer a slightly lower price for cremed honey. Currently, I sell my liquid honey for $11.00 and my cremed honey for $10.00.

It is only a dollar difference, but that savings motivates many buyers. The justification I offer is that cremed honey takes less effort, less maintenance, and therefore can be had cheaper. Holding up both items, I say, "This one is $11.00 and this one is $10.00." You'd be surprised how many people are motivated by the lower-priced offering.

"But they taste different, right?" A customer might ask.

"No, they're both honey," I respond. "The cremed is more solid, grainier. The liquid goes down smooth. But it's all the same product."

• The visual pitch. Many prefer the liquid variety because of its purity and clearness. So one must emphasize the interesting visual properties of cremed honey. Call it romanticizing the chunky. I might offer something like the following: "Look at this bottle. It looks like an ancient cave, with hieroglyphics written all over the walls. What does it call to mind? If you say ancient civilizations, of the myriad paths of history, of how the foundations of our modern world stack up upon each other, I would agree. Of course, honey played a part in this past. Just to point up one example, kings were mummified in honey in early Egyptian civilizations."

CONVERTING LIQUID TO CREMED HONEY:

1. Heat honey until fully liquefied.
2. Cool rapidly.
3. Add 10% starter of crystallized honey and mix. The finer the crystals are that you add, the finer, and smoother the final product will be.
4. Cool
5. To make *very* smooth *cremed* honey, add 10% from a jar made of *very* fine crystals. To make course and grainy *crystallized* honey simply use honey from a naturally crystallized jar of honey with course and grainy crystals.

• The store buyer approach. To the merchant, you might argue that cremed honey never alters its appearance unlike its brethren which starts to de-liquefy the minute it is put on the store shelf. Bring the merchant over to the honey shelf (that you have checked before), and point out several bottles of mottled liquidity. Suggest that no customer would buy that product. Of course, all suppliers are supposed to monitor this hardening, but often they don't get around to replacing every bottle that begins to granulate. Carrying a significant percentage of cremed honey eliminates that problem.

Personally, I only use cremed honey. Furthermore, I believe that all these arguments offered above are valid. The grainy texture melts soothingly on my tongue. I enjoy licking the knife of its globule chunks. There is nothing quite as delectable as crisp toast covered with marshmallow fluff and a generous lathering of cremed honey. I hold my peanut butter and honey sandwich confidently, knowing that drips won't fall on my lap. Then, after supper when those dessert sirens work their alluring magic, I dollop several tablespoons of cremed honey over ice cream, and enjoy the transformative experience of tasty crunch with icy dark chocolate. Yum, yum! I like it that my hands never ooze with stickiness. I smile at the thought that my wife will never command me to re-liquefy. And, yes, I peruse every jar of cremed honey, trying to decipher what the fissures and crags mean.

But I have had my failures. I periodically suggest to my club (Plymouth County Beekeepers) that we offer cremed honey at our annual 10-day fair. I argue that carrying cremed honey would only increase our variety of offerings. Members heartily veto this suggestion. Their main argument is that solid honey somehow suggests beekeeper failure. I couldn't disagree more, but I realize that old habits die hard. I believe that, behind my back, I am known as the king of solid honey.

Offering cremed or granulated honey could be your way of reducing selling effort and not incidentally, through saving time, making more money. BC

Scott is a 35-year beekeeper. The Pembroke, MA practitioner is the author of the best-selling BEE LESSONS. Contact him at ***dancinghill@gmail.com****.*

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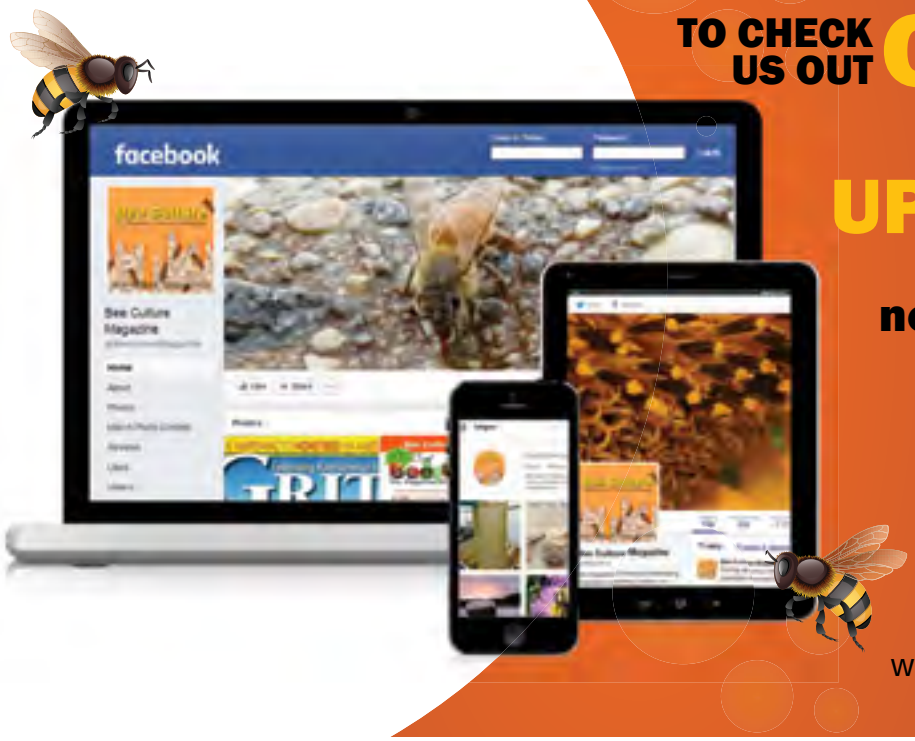

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On Honey Bees and Fungi

Ross **Conrad**

The relationship is a complicated one . . .

The honey bee has an interesting relationship with fungi. Some fungi are harmful to bees while other fungi are beneficial and can even be essential to honey bee health. In this article we explore some of the interactions between bees and some members of the mushroom family.

Chalkbrood

Most beekeepers are familiar with the honey bee fungal disease chalkbrood that is caused by the fungus, *Ascosphaera apis*. Thanks to increases in global travel and trade, as well as the migratory nature of many beekeeping operations, chalkbrood is found in honey bee colonies all around the world.

Chalkbrood was first identified in the United States in the beehive state of Utah in 1965 (Baker and Torchio 1968) although evidence indicates that it was present in U.S. territories long before then. (Gilliam, *et. al.,* 1997) Over the years, chalkbrood has spread throughout the U.S. including Alaska and Hawaii.

Chalkbrood only infects larvae that are less than one week old who consume the spores in the food they are provided by nurse bees. Older larvae and adult bees are resistant to the disease. While *Ascosphaera Apis* is fatal to the young larvae that ingest it, the disease does not typically cause the death of the entire colony, although severe cases can weaken a colony significantly. Impacts of chalkbrood on a hive can be variable both due to the health and tolerance of the colony infected, and due to the fact that there are multiple strains of chalkbrood and they vary in virulence (how fatal they are to the host) and fitness (how quickly, and how many reproductive spores they can produce). (Glinski 1982; Evison, S. E. F. *et. al.* 2015)

Chalkbood is associated with colony stress and with cool, moist and humid conditions. (Mehr *et al.*, 1976; Gilliam *et al.*, 1978; Puerta *et al.*, 1994; Flores *et al.*, 1996 ; Borum and Ulgen, 2008) As a result, infection commonly occurs in spring and in hives that are poorly ventilated or located in badly drained or shaded apiaries.

The roots (mycelium) of *A. apis* consumes infected larvae and at first it becomes soft and fluffy. The mycelium eventually mummify the larvae and turn it into hard white lumps resembling a small piece of chalk. The color of the mummified larvae will turn grey and black as the fungus enters its spore producing stage. A black mummified larvae can contain hundreds of millions of chalkbrood spores. (Hornitzky, 2001) The remains of infected larvae can be found in brood cells, on the bottom board and in front of the hive entrance as it is cleaned out by worker bees.

Pathogen transmission can occur through adult bees within and between colonies, primarily through food sharing and through beekeepers transferring infected equipment between colonies. (Gilliam and Vandenberg 1997) Spores are found in beeswax, pollen, and honey and have been shown to remain viable for at least 15 years. (Gilliam, 1986; Gilliam and Taber, 1991; Anderson *et al.*, 1997; Flores *et al.*, 2005a ; Flores *et al.*, 2005b) Feeding colonies honey harvested from infected hives can also spread the disease since spores have been shown to remain viable in honey even after two years of storage. (Gilliam and Vandenberg 1997) Thankfully there are no honey bee diseases that can infect humans.

While there are no registered chemicals available for treating colonies infected with chalkbrood, beekeepers have been able to clear the disease using a variety of methods. These methods include using hygienic bees, re-queening (especially with a young queen from a hygienic colony), locating apiaries in well-drained areas and in full sun, rotating old comb out of the hive on a regular basis, and avoiding the transfer of combs between infected and uninfected colonies. Since the condition often

Mummified larval remains from chalkbrood are the most common fungi beekeepers notice in their hives.

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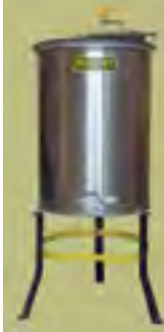

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clears up on its own once a strong nectar flow is initiated, feeding bees sugar syrup is sometimes used by beekeepers to help clear chalkbrood symptoms from infected colonies, though spores remain.

Studies also indicate that essential oils containing citral, geraniol (found in lemongrass oil) and citronellal have an inhibiting effect on fungal growth in vitro. (Calderone *et al.*, 1994; Davis and Ward, 2003). While additional research is needed to confirm such beneficial effects in the field, some beekeepers are experimenting with using bee products that contain lemongrass oil such a Honey-B-Healthy and Pro-Health from Mann Lake Bee Supply to help clear colonies of chalkbrood.

While some folks may be tempted to seek a fungicide to control fungal hive diseases such as chalkbrood, a wealth of research indicates that a dependence on synthetic pesticides and antimicrobials can lead to general deterioration of the colony environment and bee health in general, therefore minimizing the use of pesticides inside and outside of bee colonies is recommended. (Bogdanov *et al.*, 1998; Bogdanov *et al.*, 2004; Frazier *et al.*, 2008)

While I have often seen cases of chalkbrood in my bees, the infection has typically been quite mild and I have never had to take any special steps to control it. Last year however, I experienced a hive that had the most severe case of chalkbrood I have ever seen. The colony was weak and struggled most of the summer until it eventually went queen-less. Thankfully, not all fungi are detrimental to honey bee colonies and some may actually be an asset.

Fungi for Varroa Control

Studies conducted at Cornell University have found that the entomopathogenic fungi *Metarhizium anisopliae* and *Hirsutella thompsonii*, kill *Varroa* mites when applied to colonies but do little harm to bees due to the fact that bees are meticulous groomers and readily remove the fungi spores from their bodies preventing infection. (Kanga, L.H. et. al. 2002, Kanga, L.H *et. al.* 2003) Researchers found the fungi took at least several days before it became effective on the mites and was active for at least 42 days after application making them not only a potentially safe bio-pesticides, but long lasting ones. This indicates that entomopathogenic fungi do not provide a quick, "flash kill" like so many of today's commercial *Varroa* mite controls, rather they suppress pathogens and tend to work relatively slowly to kill mites over time.

Numerous trials have been conducted in an effort to find effective application methods. Hives made with mushroom mycelium in compressed sawdust and pieces of cardboard inoculated with mycelium of *M. anisopliae* have both been tested. (Kanga L.H. *et. al.* 2006) Better results appear to have been obtained through the conventional delivery system that beekeepers are already familiar with for various hive products: sugar patties. Containing the fungi within the patties seems to help protect the fungal spores from brood nest temperatures and has shown to be an improvement over the cardboard and compressed sawdust hive components application systems when introducing the biopesticides into bee hives. (Kanga, L.H. *et. al.* 2010)

One company, Strong Microbials out of Milwaukee, Wisconsin, is currently working on a fungal containing product called BioVar®. BioVar® is a biopesticide is made up of two entomopathogenic fungi (*Metarhizium anisopliae* and *Beuavaria bassiana)* and three spore forming bacilli [*Bacillus sphericus, Bacillus thuringensis (krustaki), and Bacillus thuringensis (israeliens)].* BioVar® is a dried powder that is mixed with powdered sugar and applied to colonies. The fungi and bacterium in the product are intended to work together to suppress the mites and the additional burden of Varroa associated viruses often referred to as parasitic mite syndrome (PMS) in hives. (Hamiduzzaman, et. al., 2012)

While Strong Microbials is pursuing EPA registration for BioVar® they have run into the usual challenges of getting the product to work consistently. The difficulties applying fungi as a biopesticide inside the hive are significant. First manufacturers have to develop packaging so that the fungi have a long shelf life and can be applied by beekeepers into hives easily and effectively. Then there are the additional challenges of figuring out the optimum timing for treatments and optimum dosage. Previous researchers have found the viability of fungal spores has tended to decline during application, and low rates of infection of the phoretic mites has taken place due to the honey bee controlled temperature and humidity inside the hive. Consequently, Strong Microbials expect that the best application method will target reproducing mites within the larval cell, and are currently testing this approach. While Mr. Slava Strogolov, CEO of Strong Microbials, keeps a research apiary in Milwaukee, WI, the company also recruited 50 beekeepers in different states to help facilitate the testing of this potential product.

Meanwhile, research has shown that the beneficial fungi that exists in the honey bee digestive tract and are used to help ferment pollen into bee bread are adversely affected by standard colony inputs such as high fructose corn syrup, formic acid and oxalic acid. (Yoder, J.A. *et. al.* 2008) This suggests common hive inputs may adversely affect microbial based biopesticides as well.

Additional research has already confirmed the harmful impacts of antibiotics on the microbiome that exists in the honey bee's gut. (Raymann, K. *et. al.* 2017) This research implies that foraging bees that are exposed to fungicides, and pollen with fungicide contamination, could also be a complicating factor in the successful use of fungal biopesticides for *Varroa* control.

Honey bees are known to visit wine cap mushroom beds (*Stropharia rugoso-annulata)* and suck up the sweet secretions of the mushroom's mycelium. This has led some researchers to suspect the nutritional support that fungal extracts can offer may be able to play a significant role in improving and maintaining bee health.

Steve Sheppard and Brandon Hopkins at Washington State University, have teamed up with Paul Stamets of the company Fungi Perfecti, to not only conduct their own tests of various methods of using and applying entomopathogenic fungi for *Varroa* control, and also whether certain mushroom extracts can help bees confront PMS. Initial findings suggest that there are a number of species of wood-rotting fungi may help reduce honey bees viruses and increase their lifespans including Reishi *(Ganoderma lucidum)*, the Red-Belted Polypore *(Fomitopsis pinicola)*, and Amadou *(Fomes fomentarius)* mushrooms.

Tests are being conducted by adding mushroom extracts to water that is fed to colonies. The folks at Fungi Perfecti are hoping to have a new product targeted to honey bee pathogens sometime in 2018 if not sooner.

Despite its challenges, use of fungi in honey bee colonies is not far-fetched given the discovery of stingless bees from Brazil that feed on a certain fungus in a way that parallels fungus farming insects. (Menezes C. 2015) The symbiosis between bees and fungi appears to be more frequent than has previously been believed and continues as a growing area of interest and study. BC

Ross Conrad is the author of Natural Beekeeping: Organic Approaches to Modern Apiculture, 2nd Edition (2013)

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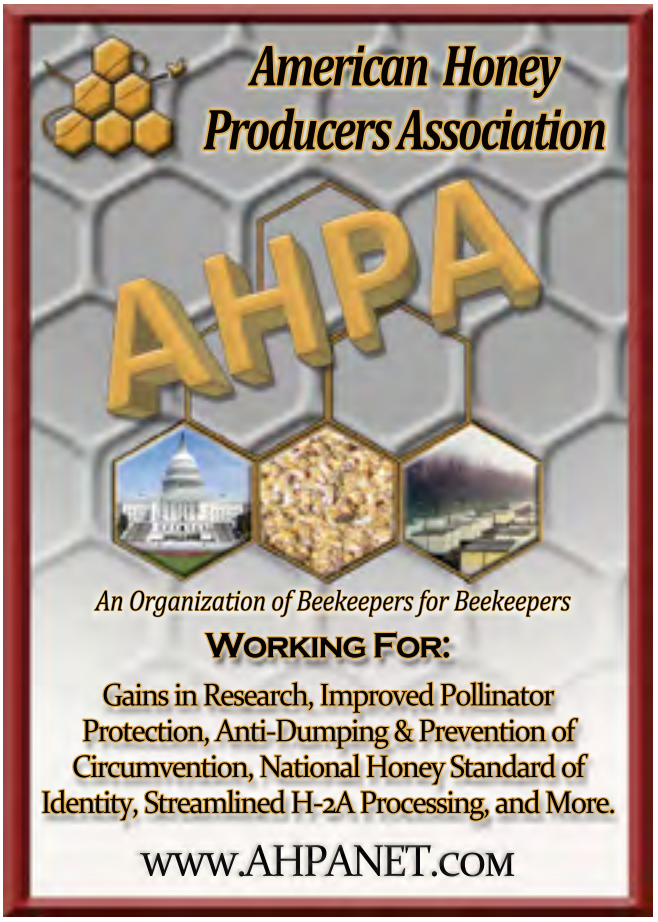


All The Buzzzz in...

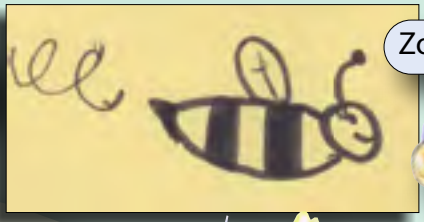
Hello Friends,

Summertime is sweet and so are you!

Bee B.Queen

Bee B. Queen Challenge

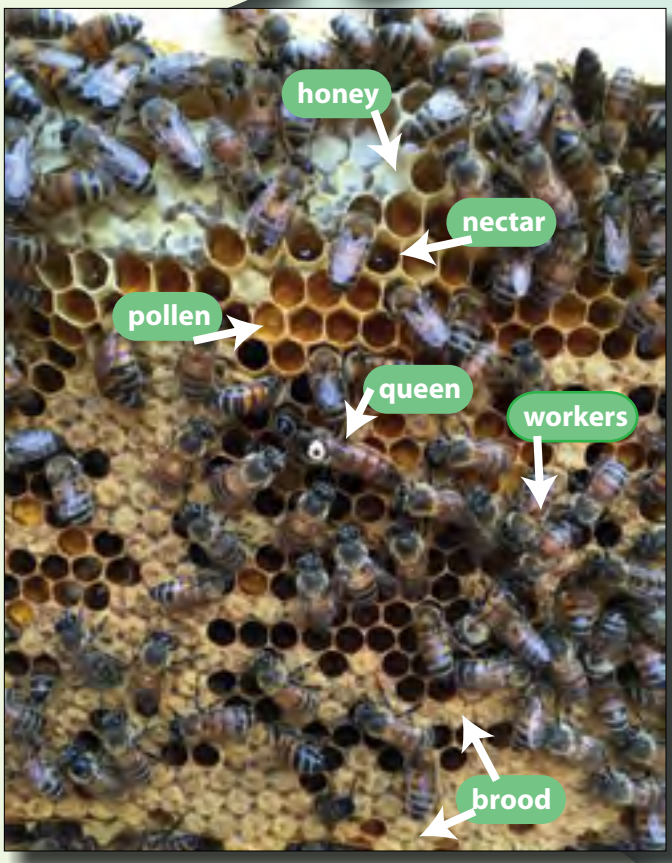
Send me a photo of your hive.



Zoe, 7, TX

Inside a Hive

Let's take a look inside the brood box where the queen lays the eggs. The frames in a healthy brood box contain eggs, larvae, pupa, pollen, nectar and honey.



Baby Bees

Inside the brood box you will see different stages of bee development. Is the queen laying eggs? Look carefully. You can see the eggs but they are very small. Carry a magnifying glass with you when opening a hive to get a closer look.

After three days the eggs hatch into larvae. The larvae look like little white C-shaped worms in the bottom of the cells. For three days nurse bees feed the larvae a nutritious food produced by glands in the head of the young worker bees. After that, the larvae is fed bee bread (a mixture of pollen and honey) until the larvae develop into pupa.

When the worker bee is about 8 or 9 days old, the cell is covered with a wax cap. In this prepupa stage the baby bee spins a cocoon. Then it's pupa time! We can't see this part of the bee development since the cell is covered. Just know inside that dark cell the baby bee is forming legs, wings, body parts and organs. After 19 – 22 days the worker bees chew through the wax cap. Adult bees!

Average Develpment Time in Days

	Egg	Larva	Pupa	Total
Queen	3	5	7	15
Worker	3	6	11	20
Drone	3	8	13	24

Pollen

Worker bees gather the pollen from flowers. They have a built in "basket" on their back legs to carry the load to the hive. The pollen is packed into the cells for the bees to use as food. Most pollen is yellow or orange but you may see shades of red, green, or purple pollen.

Honey

Sometimes you will see a clear liquid in the cells. Any guesses what that may be? If you said nectar you are right. The worker bees flap their wings to send air across the nectar to evaporate the water. When the water in the nectar is about 17%, the bees will cap the cells with wax. Then they have delicious, sweet honey!

1B, 2D, 3A, 4E, 5B, 6F

ooo Bee kid's corner

Produced by Kim Lehman -www.kim.lehman.com
www.beeculture.com
August 2017

See It, Make It

Create a model of a frame from the brood chamber using cardboard tubes.

1. Cut cardboard tubes into short segments about 1 inch long to represent the cells.

2. Stand them up on a piece of cardboard or foundation inserted into a hive frame.

3. Eggs: Place a white bean in the center of the "cells" on the frames.

4. Larvae: Make different sized larvae by rolling up pieces of white tissues. Secure the ends with tape. Bend into a C-shaped and insert into the cardboard tubes.

5. Pupa: Stuff brown tissue paper or brown pom-poms into the "cells."

6. Pollen: Place yellow pompoms in the cardboard tubes to represent pollen pellets collected by the bees.

7. Honey: Stuff yellow tissue paper in the "cells" to represent honey.

8. Use a marker to label the contents of each cell.

Bees

Bees, bees, bees
Please send to me
A jug of honey
As fast as a bunny

Bees, bees, bees
Don't fly to me
They can sting
About everything

Bees, bees, bees
Fly to a tree
Fly to flowers
Just before showers

Bees, bees, bees
Don't fly to the east
Because all bees
Can freeze

Bees, bees, bees
What will you be
Will you be green
When you are a queen

Mary Yoder, NY

Bees by the Numbers

Can you match the numbers with the factoids?

1. Number of days for a queen to fully develop.
2. Number of loads of pollen brought in by the forging bees to fill one cell.
3. Number of pollen pellets to raise one bee.
4. Number of times a larvae is fed daily.
5. Number of days it takes for a bee egg to hatch.
6. The fifth day of a bee's development will be ____ times the weight of the egg.

A. 1 ½
B. 3
C. 15
D. 18
E. 150 – 800
F. 900

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BIGGER PICTURE

Jessica **Louque**

Honey Daze

This was going to be the year. We were determined to harvest honey this year. I hadn't had a honey crop since the year before I was married. Something about suddenly adding four kids to your every day life seems to suck a lot of your time into other activities, I guess? This year, the kids are old enough to either leave (temporarily) them to their own devices or have them help us in the bees. We made a specific effort to make time for the bees, even at the expense of some other "necessary" chores. I should probably take this time to apologize to all my (one) neighbors who have had the privilege of watching our yard slowly grow into a jungle. The quail were a good excuse to not mow, or giving the birds a hiding spot from the hawks trying to eat them. Maggie finally passed the weight limit safety cut-off on the mower without filling her pockets with rocks, so we can get her out to bring down the grass to a manageable level while we worked in the bees.

There was a little more interest in honey extraction this year. Annie Krueger, an intern on a two-year appointment with the Bayer Bee Care Center, had started a research project with the massive quantity of hive scales left over from other bee studies. She was giving them to local beekeepers with the expectation of keeping basic records on what happened to the hive (added a super, fed it, moved it) and uploading the data every Tuesday. She was taking the data, putting it into some sort of reasonable semblance of summary, and then explaining what appeared to be happening across the area. At the time, the largest hive in the project was around 270 pounds. I was pretty sure that one of the hives that I was babying would be larger than that, so I told Annie that I wanted to join her project. I can tell you if you haven't guessed that Bobby was NOT excited. To better enjoy this description, please imagine Bobby's reactions throughout these events. I gleefully took home a scale, only to realize I had not thought through some of the logistics.

Big Bertha was sitting on a hive stand in all her glory of four deep supers being used as brood boxes and four medium supers for honey. We came home, trying to beat a rainstorm, and realized there was no way we could lift the hive up to get a scale under it. The next option was to take it apart until we could pick it up and get a scale under it or move it over and set it back. I could not hold it and slide a scale under, so we moved it, put a scale down, then moved it back and put all the pieces back together.

While you're imagining Bobby's fantastic facial expressions and otherwise disgruntled figure, keep in mind that rainstorm I mentioned was a very large storm and the clouds were already over us and the wind was picking up. Various pieces of yard trash from our neglect were rolling across the driveway like tumbleweeds. We've also taken apart a hive large enough to support eight boxes during a barometric pressure drop in rising winds. The bees were almost as happy as Bobby and starting to let us know it.

So, we get it ratcheted, and I realize that Big Bertha now looks like one of those playground toys where you ride a zebra attached to the ground by a spring. Bobby's face now mirrors the oncoming storm as I tell him (yelling over the wind, actually) that we're going to have to take it apart again and set the whole thing on the ground. We dissect the hive AGAIN and set the bottom most boxes on the hive scale, which is now relatively stable on cinder blocks. Or so I thought (which was wrong). We get Big Bertha back together, and realize the scale is still wobbly, but it's because we need to move the entire hive over about a foot. Something that's not level on a hive that's three or four boxes high is not as bad as eight high. Instead of taking the hive apart for the third time, Bobby holds the hive "still" while I sit on the ground and kick cinderblocks under the scale to slide it over without picking anything up. I assure you, I was just chock full of great ideas that day.

Finally, she's on the scale, on the ground, and the wind settles in to pull in the storm. Big Bertha is waving like a surrender flag, trying to topple all our work. I took a hive weight just to confirm that the scale was working, but even if it wasn't I would not have told Bobby right then. Big Bertha was starting at 320 pounds! While this was really cool, that's a lot of weight not distributed well to withstand weather. Best idea of the day: moving our Ford Expedition to the side of the hive to ratchet it to the luggage rack. Not only did that pull too much, but it blocked off the other hives on that side and made them join the anger flight taking place around us. In the end, Bobby made some lean-to support beams that wedged into the ground to hold Big

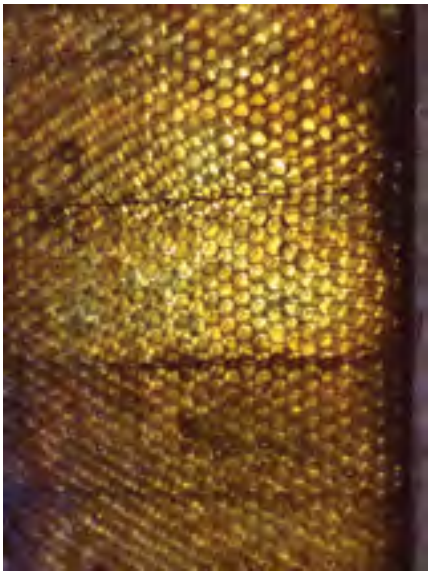
Bertha up against the wind and using her own weight to keep the beams in place on the slant. This didn't do a lot to stop the swaying because the wind really picked up and maybe it had started the first taps of pelting rain. The last great idea of the day (probably my only good idea but a day late and a dollar short, as they say) was to take the top supers off, cover them with lids, and ratchet Big Bertha without them to make it slightly more aerodynamic and not top heavy until the storm was over. These bees were our best friends now, and wanted nothing more than to cuddle our faces with their stingers. This is probably the only reason Big Bertha survived that storm.

It was hard to leave the hive alone for the first few weeks because I wanted to go out every day and see what was happening. In some cases, she would grow around three to five pounds a day! I learned that according to the scale reader, the heaviest weight of the day is the 8:30pm reading because all of the foragers have come home but they haven't been inside long enough to eat all the food stores from the day's foraging. It wasn't all weight gains though, because we have had such a crazy Spring and had about 15 inches of rain in April and May during the time that I was recording scale data. There were a few times that the bees were stuck inside the hive for days on end while it rained constantly. Those were disappointing days because the hive would lose so much weight sustaining a giant colony.

We eventually came to the day where we had time to do some honey extraction, which was when Big Bertha reached a little over 350 pounds. We knew not all the honey was ready, but we figured we'd give it a shot while there was time to do it. Charles in particular helps in the bees more than the other kids, and he came out to help for most of the day. Maggie and George even helped for a little while, but the bees learned how to get in the hole that runs an extension cord inside, and it was around a hundred degrees during extraction. They lost interest other than quick trips out to see how it was going. We took supers from Big Bertha and a handful of other hives and brought them into the honey house for extraction. Maggie, Charlie, and George all had a chance to try their hand at uncapping frames and watching the extractor. After a good 12 hours, we ended up with a huge mess and around 27 gallons of honey. Based on the weight loss, we took around 160 pounds of honey from Big Bertha, maybe reducing her to just "Bertha" by then.

Since honey extraction, the hives have either vaguely held steady or slowly lost weight. We have scales on a few hives in other places to compare the honey flows in different areas. Honestly, we moved almost 50 hives to four other sites to reduce the competition for Bertha to grow. We now have hives in Caswell, Alamance, and Stokes county, although they will probably be consolidated for

the Winter so we can manage them better with supplemental feeding and *Varroa* treatments. I don't know how long Annie will keep her project going, and maybe she doesn't know either, but it will be interesting to have a year's worth of data to compare to next year and see how much it changes. We don't really have a "normal" anything in the climate here so I don't know how comparable the data will be. If you're an NC beekeeper and you're interested in participating in Annie's project, or you want to read more about it and the weekly findings (updated on Wednesdays, usually) check out the website at: **https://beehealth.bayer.us/bayer-bee-care/bee-care-research/hive-scale-research#phcontent_12_divAccordion** BC



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In Search Of The Better ~~Mousetrap~~ Beehive

Ann **Harman**

When people start looking for a place to live – a home to own – they generally have a good idea what their *needs* are. And they know their *wants* – some special things to make it their dream home. The *needs* and *wants* are highly variable, even different in different climates. And frequently the *needs* of a perfect place to live come before considering the *wants*. However, many homeowners are enthusiastic do-it-yourselfers. After a few weekends a *want* leads to a new patio. After that perhaps a garden shed. The DIY projects are endless. Build bookshelves, reconfigure a closet, turn a bedroom into an office and perhaps build a beehive.

What do European stock honey bees in search of a home look for? A dry cavity. That is top priority on the *need* list. (Sometimes it can't be found.) What about the *wants*? Well, the preferred size is 40 liters, making a deep Langstroth hive body just right. Close to that size is acceptable. Next, a definite *need* is a small entrance that can be easily defended. The bees would like the cavity placed not too close to the ground. The bees, industrious do-it-yourselfers, will take care of building their own furniture (comb).

What does the beekeeper want? A hive (the bees' dry cavity) that makes it easy to accomplish the beekeeper's goals. Is it honey production? Then definitely the hive itself and its parts should be easily movable, whether in beeyard or for traveling to lush nectar forage. What about pollination income? Basically the same as for honey production. Perhaps the beekeeper wishes to be a hobby beekeeper or be a protector of honey bees. Since these hives will not be moved from place to place, then any sort of hive that will be convenient is acceptable.

Looking back through the history of manmade beehives is quite fun. In places where trees were scarce, mud was easily shaped into cylinders. Plugs to cap both ends could be made of reeds. These supplied a small entrance for the bees at one end. At the other end the reed plug could be removed for access to the combs with honey. The clay cylinders provided the dry cavity and small entrance but when stacked probably made it difficult for the bees to distinguish their own cylinder.

In areas with plentiful trees, such as in parts of Europe and also in the United States, a beekeeper could 'own' a tree with bees in it, marked so that other beekeepers knew it was owned. At one point it seemed much easier to just cut down the tree, saw out the part with bees and take it home. Now the hive was much more convenient for the beekeeper. The bees had their selected dry cavity with a small, defensible entrance. However it was now much closer to the ground. The beekeeper could remove the slab of wood put on top of the log and harvest the combs for honey and wax.

The skep, a familiar symbol of bees and beekeeping, was common in those parts of Europe that did not have dense forests with hollow trees. Skeps were essentially a basket turned upside down. They were certainly easy to make and were lightweight. They did provide a cavity but needed protection for it to be a dry cavity. The small entrance was not a problem. However its placement varied. Some entrances were at the bottom, others anywhere on the side. The basket shape, size and weight were certainly convenient for the beekeeper.

The cavity was a bit small but swarming was an important part of skep beekeeping. Destruct harvest was the common method of harvesting honey and beeswax. The bees were simply killed. Therefore, half the hives were harvested. The other half swarmed and the beekeeper would hope to capture the swarm in an overturned skep. Since bits of beeswax remained after the destruct harvest, the skep would smell suitable as a home for the captured swarm.

Skep beekeepers were creative. Actually all beekeepers are creative. Although the simple skep shape was popular, beekeepers discovered ways to improve it. Since honey and wax were the desired products, various types of "honey supers" were added. The domed skep was changed to a more cylindrical shape and a cylindrical honey super could be put on top of the lower part that had the brood. Thus honey harvest became much easier for the beekeeper. It also saved the bees.

A great burst of creativity occurred during the latter 1600s, through all the 1700s and into the first half of the 1800s. During those many years, beekeepers created hives of countless sizes, shapes and configurations both external and internal. Wood was plentiful and woodworking tools for carpenters and cabinetmakers were excellent. In the early part of the 1800s some beehives resembled houses with doors, turrets, passageways, and even little drawers. Some parts were supposed to be used to feed the bees if necessary; other parts were designed for honey

storage and harvest. Some hives had windows for observing the bees. These usually came with a removable cover so the bees could continue to work in the dark.

What did the honey bees think? The hives were certainly a well-made dry cavity. The bees could build comb as they chose and plug up useless spaces with propolis. Entrances were small but could be anywhere. Certainly many of the hive inventions turned out to be completely impractical for the beekeeper as well as the bees themselves.

Hives, as boxes with frames, did occur during this time but since bee space had not been discovered, the beekeeper was hampered in any sort of management or harvesting. Langstroth's discovery of that magic space led to hives useful both for the bees and the beekeeper. But invention of hives did not cease. Drawings of Langstroth's actual hive show us that the world's Langstroth hive today is quite different. It is much more convenient for the beekeeper yet provides the dry cavity of appropriate size with small entrance for the bees.

Hive inventions continued after the mid 1800s but at a much slower pace. At one time the British had six different styles of hives, some of which had interchangeable parts. Now there are two but one, the National, is by far the most popular. The Warré hive appeared in the early 1900s in France but remained in the background of beekeeping for a very long time. Wood has remained the primary material for hive construction.

As the world entered the age of plastic in its many forms, plastic also entered the world of beekeeping. In the U.S. during the late 1970s and early 1980s fiberglass hives were sold. Here was a material that would outlast wood, never needed painting and withstood hard use. Beekeepers, eager to use something new, tried these hives. They turned out to be unfit for both bees and the beekeeper. The hive bodies were translucent, admitting enough light through the sides that the bees simply avoided using the outer frames at all and only partially used the ends of frames. The brood nest and honey storage area simply became smaller. The parts warped out of shape so that you could not put on or remove the telescoping cover without using a hammer.

Today plastic hives and hive parts are common. The lightweight polystyrene Langstroth hives are being sold. Plastic foundation and frame-foundation is common. Plastic feeders come in different styles. Beekeepers can buy sturdy plastic hive stands. In Great Britain the Beehaus by the Omlet company is a small plastic long hive that is suitable for urban rooftop beekeeping as well as backyards. The FLOW® honey super frames are plastic. Beekeepers are accustomed to plastics in their own lives so beekeeping with plastic parts can seem quite normal. So far the bees have not really objected.

Varroa appeared and beekeeping became more difficult. Viruses became important diseases of honey bees. New pesticides, herbicides and fungicides entered the beekeeping scene through agriculture. The death of honey bees, our pollinators of our foods, was now of national importance. How could the bees be helped? Many people, urban, suburban and rural, took classes to become small-scale beekeepers. At the same time people found out bees were in trouble they were also turning to living a more healthy life. "Natural" became the buzzword of this new era.

"Natural" spilled over into the beekeeping world. Bees should be living a more healthy life. Their home had to be natural. At first the top bar hive was selected as being a natural hive. In top bar hives the bees could build their own comb without the guidance of foundation, just like they did in a tree. Some beekeepers looked back in history and rediscovered the Warré hive. Soon these hives became more available commercially. But beekeepers are creative and enthusiastic do-it-yourselfers. Modifications to both those styles of hives soon appeared. New modifications appear on the internet frequently. After all, beehives do have to be convenient for the beekeeper or the bees could become neglected and perish.

An assortment of beehives is available today. A beekeeper can make or buy a multi-story hexagonal hive. Top bar beekeepers proudly show off their creations. Windows in hives are as popular today as they were in the past. Curious beekeepers can have a look at their bees at work, even if the view is quite limited. As long as there are people who are fascinated with bees and wish to be beekeepers, more and more beehives will be modified or invented. Those hives will obviously be ones convenient for the beekeepers but will they be convenient for the bees? At least today we recognize that bees must have that magical bee space that incidentally makes hives convenient for us.

Over the many millennia that honey bees have been on earth and over the centuries that man has made beehives, the needs and wants of the bees has not changed. A dry cavity of about 40 liters, a small defensible entrance and placed not too close to the ground. However honey bees are very accommodating so beekeepers will continue to invent and modify to provide a home for them. BC

Ann Harman cares for her Langstroth hives, writes newsletters and attends bee meetings all around her home in Flint Hill, Virginia.

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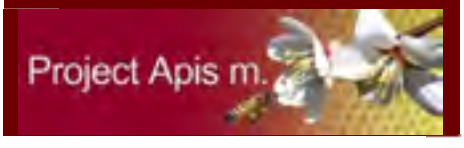

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Zika and Bee Kills

Tom **Rearick**

Bee kills from pesticide treatments are not new. What is new is a rational fear of the Zika virus and the rapid growth in commercial mosquito abatement franchises that feed on that fear. Many of these companies spray and fog at all hours of the day, in all wind conditions, and use pesticides that are highly toxic to honey bees and other beneficial insects and aquatic life.

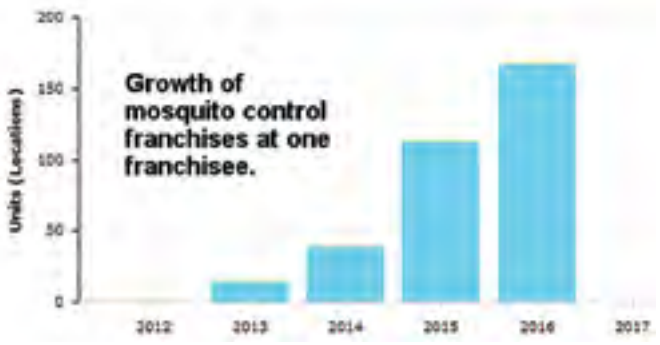
To reverse this trend, beekeepers need to communicate to neighbors and elected representatives that there are better ways to fight Zika than the scorched earth policy of indiscriminate fogging and aerial sprays. Zika is a scary virus that causes birth defects. Any attempt to minimize that threat may end any productive dialog with a neighbor. Instead, beekeepers need to become better communicators, better entomologists, and more expert pesticide applicators than the guy that drives a mosquito control panel truck.

Failing to take an active role in mosquito control education means abdicating that role to mosquito control companies that are disinclined to protect honey bees, beneficial insects, and aquatic life. Lacking better information, more households will sign abatement contracts with pest and mosquito control companies. There will be more drift of deadly pyrethrin clouds and more heartrending bee kills.

Knowledge is our weapon. Share it with your neighbors. It wouldn't hurt to also share a bottle of local, pesticide-free honey as well.

What is the Zika Virus?

Zika virus is a flavivirus, related to yellow fever, West Nile, and dengue. There are no vaccines to prevent Zika or medicine to treat the infection. Zika is transmitted primarily by Aedes species mosquitoes that bite during the day and night. Infection during pregnancy can cause congenital brain abnormalities, including microcephaly to the unborn child.



Is Zika in the United States?

Yes. As of March 29, 2017, there have been 5182 cases of Zika virus reported in the United States. 4886 of those cases were from travelers returning from affected areas. 222 cases were acquired through local transmission in South Florida (216) and Brownsville, Texas (6). Local transmission means that local mosquitoes have been infected with the virus and are spreading it to people in the area. 74 cases were acquired through sexual transmission (45), transmission from a mother to an unborn fetus (27), and other means (2).

How is Zika spread?

Zika is transmitted mostly by the bite of an infected Aedes species mosquito (*Ae. aegypti* and *Ae. albopictus*). The Asian Tiger mosquito (*Ae. Albopictus*) is found throughout most of the eastern and southwestern states and bites during the day. Zika is also potentially spread by humans through sexual activity, blood transfusion, and from a mother to her unborn fetus.

How can Zika be avoided?

Since there are currently no cures or vaccines for Zika, it is important to avoid the Zika virus:

- Reduce the likelihood of mosquito bites (see below)
- Reduce the mosquito population (see below)
- Avoid traveling to areas with Zika outbreaks. This includes most equatorial countries, south Florida, and Brownsville, Texas.
- Avoid sexual intercourse with individuals from Zika outbreak areas

What can be done to avoid mosquito bites?

- Add a fan to the porch. Mosquitoes are weak fliers and cannot navigate in a fan-induced wind. If you eat outdoors, a fan above and a small alternating fan on the floor will protect you above and below the tabletop.
- Repair small holes in door and window screens.
- Use a mosquito repellent such as DEET or Picaridin. Alternatively, Oil of Lemon Eucalyptus and IR3535 are biopesticide repellents made from natural materials.
- Pregnant women should wear lightweight long sleeves, pants, and socks when outdoors.
- Reduce mosquito populations - see next section.

What can be done to reduce mosquito populations?

- Avoid puddles and standing water no matter how small.
- Pick up toys, cups, bottles, or other yard clutter that might retain water.
- If you have a bird bath, wading pool, or small water feature, try adding a mosquito dunk. Each dunk

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In the Summer of 2016, I lost three colonies to single pesticide event. In the Spring of 2017, I assembled the following into a gift bag and gave it to each of my five nearest neighbors.

- A letter from my wife and myself (you can download a Word template at **http://www.metroatlantabeekeepers.org/zika.php**)
- A brochure from the University of Georgia School of Entomology: *Not Every Bug Is A Bad Bug*
- A printed document from Clemson University titled *How to Protect Honeybees from Pesticides*
- A small recipe brochure from the National Honey Board
- A bottle of my own honey

The response from my neighbors has been very positive. They are now armed with knowledge and have a vested interest in protecting beneficial insects.

Tom Rearick

If I knew that flowers in full bloom were being sprayed and my hives were *not* downwind, I would immediately dump honey into a pan and set it out in the apiary. The bees would find it and prefer it to other potentially toxic nectar sources. Open feeding is usually a bad idea because of the possible transfer of disease but that risk is much smaller than a known pesticide spray. This approach might work for a day in a small apiary but that may be all you need because many pesticides break down in sun and humidity. At any rate, the pesticide is less potent after 24 hours. Diluting the honey with water might make it last a little longer. If you lack the honey, you could make a cane sugar syrup.

Tom Rearick

contains a bacteria, Bti, that is harmless to humans and bees but deadly to mosquito larvae. Alternatively, change the water once a week or add a fountain to keep the water moving.

- Clean out rain gutters so that rotting leaves do not dam up water.
- Stock permanent water pools, such as ornamental ponds, with mosquito larvae eating fish such as Gambusia
- Drill drain holes in old tires. Add drainage ditches to prevent standing water after rainstorms.
- Put up bat boxes. A little brown bat - a common bat in the US - can consume about 600 to 1,000 mosquitoes in an hour. A nursing little brown bat mother may consume as many as 4,500 mosquitoes in a single evening - more than her body weight in insects. Unlike pesticide applications, bats are free and they work to reduce the mosquito population every night.
- Mosquitoes hang out in tall grass during the day so keep weeds trimmed and cut grass often.

If a homeowner must spray, what is the correct way to do it?

Some homeowners (and mosquito control companies) are going to spray. Period. We are all better off if applicators are knowledgeable in the correct way to select and apply insecticide.

- Avoid spraying flowers in full bloom.

- Apply pesticides after sunset or before sunrise. Bees do not fly in the dark.
- Avoid aerial spraying or fogging. But if you must, do not spray or fog during windy conditions. Optimally, apply the pesticide directly to the ground using a low pressure, large droplet sprayer. This greatly reduces the drift of pesticide off of your property.
- Know that some pesticides are less harmful to honey bees and beneficial insects. The bulletin *How to Protect Honeybees from Pesticides* (https://www.clemson.edu/public/regulatory/pesticide_regulation/bulletins/bulletin_5_protecting_honeybees.pdf) provides useful information on the selection of pesticides.
- Avoid pesticide formulations of dust or wettable powders which are similar in size to pollen grains. Instead, use granulars, solutions, or soluble powders.
- Spray lower limbs of shade trees, shrubs and other non-flowering plants to reduce adult mosquito population. Bees do not frequent those locations but mosquitoes do.
- Understand that in addition to gathering nectar and pollen from flowers, bees also gather water in the Summer as a means of reducing temperature inside the hive. If a bee-deadly pesticide gets into water, it is likely to be collected by a honey bee.
- Pesticide applicators should notify local beekeepers before a pesticide is to be applied. Beekeepers can cover their hives with drop cloths. That will help protect the colonies from drifting pesticide but know that pesticide applied to flowers in full bloom is likely to end up in bees and spread to other bees in the hive. Beekeepers should also change the water source that they provide for bees.
- Please use pesticides that have the shortest persistence in the environment. Pesticides that persist are more likely to be washed into streams where they can kill aquatic life.
- Know that mosquito treatment companies typically use pesticides from a group of chemicals called pyrethroids that are promoted as being safe and natural. They are

– to humans – but these pesticides are highly toxic to pollinators and other beneficial bugs, fish, and small aquatic organisms.
- Understand that the benefits and dangers of pesticides, as represented by commercial mosquito treatment companies is often at odds with information published by evidence-based government and university research centers.
- If you must spray, spray only as needed. Contract spraying on a predetermined schedule wastes pesticide and money and may contribute to pesticide-resistant mosquitoes.

How does Zika impact beekeepers?

Every time a news story covers the Zika, West Nile or some other mosquito-borne virus in the U.S., phones start ringing at pest and mosquito control companies. In the mind of most homeowners, calling a mosquito control company is the most rational response. A panel truck shows up – at any hour of the 9-5 work day – and workers start fogging the yard with pyrethrins. If the company is lucky, they will sign a recurring contract that guarantees multiple visits.

Pyrethrins are relatively safe to vertebrates but deadly to invertebrates such as honey bees, native pollinators, and dragonflies (that eat both mosquito larvae and mosquitoes). A cloud of pyrethrin can drift into an apiary or – if sprayed on flowers – toxic nectar and pollen can be carried back to the hive.

How can beekeepers prevent bee kills?

There are two approaches to preventing bee kills. Success in the first approach makes the second approach unnecessary.

1. Cultural Approaches

Bee kills are difficult to prevent unless you have neighbors that are educated in alternatives to fogging and are willing to work with you and inform you *ahead of time* of sprayings.

2. Tactical Approaches

If you know that a spraying is going to occur, you must protect your bees from drift and from flowers and water that were sprayed.
- Minimize effects of pesticide drift. These techniques will only work if you are warned ahead of time.
- Determine if your hives are downwind from the spraying
- Move the hives to a safe location if practical
- Cover the hives with a breathable ground cloth and wet it down to cool the colony.
- Change water sources that were exposed to drifting pesticides
- Minimize effects of toxic forage and poisoned water.
- Run sprinklers or misters to keep foragers in their hives. They will forage less if they think it is raining.
- Change the water that you provide to bees.

Help a colony survive a pesticide exposure

If a colony has lost most of its foragers but is stable after a day and still has plenty of honey and pollen, it has a good chance of surviving on its own. Move the surviving hive to a less toxic location with clean forage if possible. If you cannot move the hive or if there is insufficient forage, provide honey or sugar syrup. Provide clean water. The queen may stop laying for awhile but should resume. If she does not resume laying in a week or so, replace her.

However, if bees continue to die, there is most likely toxic pollen and nectar in the hive. The bees will continue to die until they are separated from the now toxic pollen and nectar. Shaking bees into a clean hive followed by a feeding may save them. Wax foundation that has absorbed pesticide cannot be rinsed out – it should be destroyed.

Help! My bees are dead. What should I do?

The experience of finding your bees dead in piles is devastating. One tempting response is to withdraw from a hobby that causes such a painful experience. Another response is to recognize that – as stewards of our environment – much work remains to be done and that courageous individuals can make a difference.

Before there can be any legislation to protect honey bees, there must be evidence that bee kills occur with enough regularity to enact legislation in the first place. That is why beekeepers should report all bee kills at state and federal levels.

The email address for the Environmental Protection Agency is **beekill@epa.gov**. The Honey Bee Health Coalition Quick Guide to Reporting a Bee Kill Incident (http://honeybeehealthcoalition.org/wp-content/uploads/2017/03/Quick-Guide-to-Reporting-a-Bee-Kill-Incident-Final-122316.pdf) is available to help beekeepers report an incident to the State, the EPA, and pesticide manufacturers as well as how to obtain non-governmental help. BC

Additional Resources
- American Mosquito Control Association (**http://www.mosquito.org/**)
- EPA: Protecting Bees and Other Pollinators from Pesticides (**https://www.epa.gov/pollinator-protection**)
- EPA: Tips for Reducing Pesticide Impacts on Wildlife (**https://www.epa.gov/safepestcontrol/tips-reducing-pesticide-impacts-wildlife**)
- UGA: Pollination: Protecting Pollinators from Pesticides (**http://caes2.caes.uga.edu/bees/pollination/protecting-pollinators-pesticides.html**)

Template of a letter to send your neighbors can be downloaded at **http://metroatlantabeekeepers.org/zika_letter.doc**

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Backyards & Bees

Eugene **Makovec**

Four years ago I moved bees from Kirkwood, Missouri – the heart of the St. Louis suburbs – to my new home in rural Lincoln County. I live in a development that was cut out of farmland in 1999. Its 33 properties range from two-and-a-half to five acres, and perhaps 20 are occupied.

The tiny town of Foley (population 161) is about a mile away, and except for a few patches of trees we are otherwise surrounded by agriculture - mostly corn and soybeans rotated year to year. It's all GMO (Roundup Ready), the corn seed-treated with neonics. One would think, from so much that we read and hear, that this would be the worst possible place to bring bees.

As it happens, not only do my bees do as well here as they did in the burbs, but I have never seen so many native pollinators!

Diane and I have two-and-a-half acres, including a 40x80-foot garden where we plant all kinds of veggies, herbs and flowers. Native wildflowers bloom in parts of our yard, along the ditches and on the undeveloped lots – which generally get mowed about once a year.

But here's what's interesting. We have six beehives in the backyard, so there are perhaps 200,000 foragers heading out each day to parts unknown. I say parts unknown, because as I walk around the garden, the yard and the neighborhood, I mostly see everything BUT honey bees!

We have a plethora of carpenter bees and at least two species of bumbles. There are squash bees on the squash, and sunflower bees on the sunflowers. I see mason bees, digger bees, tiny brown sweat bees, those really cool metallic green sweat bees, and some other bees I can't identify. We also have a bunch of different moths and butterflies, and some cute yellow googly-eyed flies. Even a few wasp species get in on the action. I never saw that kind of pollinator diversity in Kirkwood, or back in Wisconsin on my parents' dairy farm.

Bee and cucumber beetle on ironweed.

Now, when my little plot of buckwheat blooms, it literally hums with honey bees, along with numerous other critters. Ditto for the peach trees, blackberries and clover. For most everything else, the natives have it covered.

So where am I going with this? Well, last Summer, a man from the MO Department of Conservation called and asked me to talk about honey bees at the State Fair. Among other things, he wanted me to discuss current challenges facing the bees, and their role in our state's food production.

A day or two later, he called back with a change in plans. Some of the MDC higher-ups, it seemed, were not too keen about the focus on honey bees; while this "invasive species" holds some importance to Missouri agriculture, the Department has a preference for native pollinators. Would I be able to talk about them as well, or did I know anyone who would?

I referred him to Ed Spevak, Curator of Invertebrates at the St. Louis Zoo. I'd heard Ed speak twice, at the Zoo and at our local bee club, and he truly is an expert in this field.

So MDC scheduled four one-hour lectures – before and after lunch on Tuesday and Wednesday. Each hour would be split between Ed talking native pollinators and me discussing *Apis mellifera*. The outdoor venue – a small amphitheater adjacent to the Conservation Building – made PowerPoint impossible, but at least the short time-frame allowed for easier memorization.

I touched base with Ed and we decided we'd each talk for about 25 minutes and then share the stage for a 10-minute Q&A. The problem with that approach quickly became apparent when Ed went first and covered about half my subject matter! The good news was, this left me time to respond to some of his other points, and also made me glad I wasn't using a slide show.

Ed spent a good portion of his talk explaining how honey bees are not really very efficient pollinators. On a bee-for-bee basis, many if not most of the native bees do a better job, and some seem to have evolved to pollinate specific species. Bumblebees do a better job of shaking loose the pollen on many flower types, and they work in colder, wetter weather than our bees do. Orchard and mason bees are much more efficient in apple and pear trees – in part because they are attracted by the flowers' pollen, whereas honey bees come only for the nectar. And like the highly specialized sunflower and squash bees, blueberry bees are perfectly designed for the "buzz pollination" required by that plant's flowers – a trick for which the honey bee is not so well adapted.

All of that is true as far as it goes. And as my experience has shown, the average homeowner probably doesn't need to install a beehive to have a successful garden. If you or I plant a packet or two of pumpkin or zucchini seeds – or turnips, or peppers, or sunflowers – there may well be enough native bees in the area to get the job done.

But, as I explained to the fairgoers, that's not how most of our food is grown. There are over three hundred million people in the U.S. Very few have the time and the space to grow a garden, and those who do cannot hope to grow all that they need for subsistence. Even full-time farmers specialize in crops that pay the bills, and buy most of their own food at the store.

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Also see Phil's Bee Culture Q/A column in this issue.

Honey bee, sweat bee and googly-eyed fly on dandelion.

Black wasp on flax.

So like it or not, the bulk of our food comes from production agriculture. Big Ag, if you will. Even the produce you buy at your local farmers' market is likely grown in several-acre fields, with seed planted by the sack rather than the packet.

This production agriculture requires production pollination. Most crops only bloom for a matter of weeks, and it may be raining for half that time. So you can't always rely on whatever bees happen to be in the area; when your livelihood depends on it, you bring in the big guns.

Over half the nation's managed honey bee colonies go to California every year for the February almond bloom. But that's not the end of it; many of those colonies then migrate to apples, cherries, pumpkins and other crops. Some 400,000 honey bee colonies were rented last year just for blueberries.

That is not to say that the natives aren't important. And when I give talks to the public, people always ask what they can do to help these pollinators.

You can begin, I say, by calling off the war on weeds in your own yard. I use the example of the landscaping company that advertises a "barefoot lawn". They come in and kill all the dandelions, clover, violets and anything else that threatens to make your yard interesting. Then they plant a lush carpet of non-native grass that requires constant moisture to stay green. So you end up putting more water on your lawn than in your swimming pool, and more gas in your mower than in your Suburban. All in all, this "barefoot lawn" costs you hundreds of dollars per year.

"I have a better idea," I say, holding up a pair of flip-flops. "Ten bucks, and you can walk across your yard and enjoy the flowering plants, and all the buzzing critters who come to visit. And while you're at it, you can teach your children to respect nature rather than fear it." BC

Googly-eyed fly.

DOWNTOWN

Keeping Bees Where The Poop Hits The Fan

I recently told a reporter (who wasn't there for me) that this should be her headline: *Largest Sewage Treatment Plant Uses Child Labor to Harvest Honey from Wastewater*. That's because DC Water, operator of the Blue Plains Wastewater Treatment Facility and drinking water supplier to the nation's capital, had held its first-ever honey harvest at Washington's Maury Elementary School. On May 31, third graders who'd studied bees all year harvested frames, built native pollinator nests, decorated hive bodies, took honey home, and generally had a sticky and noisy good time. Though no one liked my headline, the honey has serious fans.

It is easy to sell this story by starting out with a happy ending about the unlimited potential of urban beekeeping. I would, however, be skipping a couple of rough winters and lessons learned along the way, some that might help you or others searching for an unlikely-yet-sustainable urban apiary. Or maybe slow you down a bit.

Urban beekeepers are constantly looking for those unthought-of apiary locations: just this week, an official mentioned that there are currently 261 registered hives in DC–which we all know means that there are at least 500 within our 68 square miles. That's a sneer-worthy figure for cities like London, which had over 3,300 known colonies five years ago. Here, a minority of of us own something as ordinary as a backyard. Some of us don't get access to the roof over our heads. Many spend weeks, or months, wracking their brains in the search for space and apiary possibilities. As a result, they roll the dice from time to time in the hope that unusual apiaries will work out.

It's all a crazy hard problem to work out as a beginner. If beekeeping is about the welfare of pollinators, however–especially honey bees–and a green future as well as contributing to the environment, caring beeks might ask, "Is more *always* a good thing?" and "does *every* setting offer potential for bees?" even while many are seeking out their first chance.

This continued growth is a surprise. Years after the disappearance of Colony Collapse Disorder, which placed problems facing beekeeping on center stage, we still attract more urbanites than we can seat in courses. They set up and register more hives every year, and more would if they could find a patch on which to place one (or two, or four, which we know is where these things go). Bees not only show up on surprisingly healthy residential roof tops, or green roofs on fashionable LEED-certified office blocs, but in places that push the edges of experience and established practice. This article shouldn't hinder that exploration, but tell a tale that says it must work for the bees first–and that might take a while to work how.

Here's how we ended up keeping bees at the most industrial site in DC, why we tried, and how we have finally seemed to get it right. *Probably*.

For three years, DC Water has hosted four colonies of honey bees. It took two years *before that* to get the bees their security pass, and it was only this year that DC Water went public. Why? Because you don't mess around with the Capital's water supply, and no one involved thought it was necessarily a slam dunk. And it wasn't. Five years in, this was our first harvest, and much honey came from colonies we consolidated to survive the winter.

DC Water is one organization, of any category, which I admire most. They employ, and sometimes create, emerging technology that pushes our water quality to the edge of current limitations. They engage in mind-bendingly creative and effective financial dealings that allow them to revolutionize the water infrastructure of DC, and they recycle poop into "Bloom," a freely distributed soil additive that you could eat if you wanted to (though few do: the third graders and I made seed balls out of it). The Bloom guys, Bill Brower and Chris Peot, made the Blue Plains Bees possible.

You will not be able to start an apiary at a public utility by calling someone up and asking, however. We got our chance because DC Water was not our first rodeo. We long ago realized that we had to weave ourselves into the DNA of community organizations, initiatives,

A Bunch Of Other Machinery, Too.

Blue Plains entrance.

government agencies, churches, and more to become ordinary enough to survive. *Ordinary.* Maybe even boring. We had to be a trustworthy part of it, not renegades. So, we ventured into community gardens, hotels, food banks and schools. We run the honey contest for the DC State Fair, we signed agreements with Parks and Rec, and teach in cooperation with the University of DC's Extension Service.

We needed that experience to work with DC Water, much of it to deal with the two-year set up phase. We met and listened to union reps, HR, safety officers, management – and they visited our apiaries. Community meetings took place onsite. Questions were asked, discussions were had, proposals were drafted, agreements were negotiated. I went through a security process, and can work with only two people at the plant, no helpers from my club. This may seem Orwellian, but the reasons for the caution seem to be important for urban beekeepers pursuing unlikely sites anywhere. We had to work out who had access to the bees and how; procedures for avoiding and responding to problems; dealing with non-beekeeper folks whose jobs put them in contact with the bees; deciding who owned the bees; who had liability for what; how to get bees in and out of there; times and means of access – you get it. We had to imagine *way* more angles than the average urban apiary, but everyone with an out-apiary faces at least a half a dozen of these issues.

It was no accident that we set up on the roof of the Central Maintenance Facility (CMF), a three-story office building, rather than an industrial shed. Management was demonstrating that this was in line with major green goals, and they were not afraid. The relatively low elevation of the CMF was promising in light of the consistent, prevailing winds that blow over the plains which stretch from a forested ridge to the Potomac River. Greater altitude would magnify the wind. Both the undeveloped river edge and the mass of trees were in plain view of the roof (across a bunch of industrial pipes and trucks and processing pools).

Supers decorated by school kids.

This is, however, the most difficult apiary I ever managed. A lot of it came from those winds and the illusory nearness of forage and fresh water. Another part was discovering that key information was in the hands of others, and I knew about neither the info nor the contact person.

For instance: throughout Year One, there seemed to be no shortage of water and no reports of bees drinking from inconvenient locations. However, in late summer we saw spectacular dwindling accompanied by low mite counts and decent amounts of honey. Theories were advanced, feeding happened, colonies were consolidated, and losses still took place. In December, however, one of the HVAC guys showed my contact the equivalent of a heaping shoebox full of dead bees that he had taken out of a roof ventilation unit. The *second or third,* he said. It turns out that we had lost the equivalent of at least four packages of foragers into an important building mechanical system (requiring the technician to intervene!) at a time of great dearth and the production of winter bees without figuring it out, in part because we saw rivers and pools. The staff did not know that what they were seeing was important to us, also.

Getting bees to go to the right water is a challenge in any high-population setting. Here, we had to get serious and enlist other people to make sure that the water offered was more attractive and available, and a whole lot closer than any ventilation rig. I needed folks to keep the water station filled more often than I could visit, and this year we will add Boardman feeders full of water to the landing boards.

We also learned lessons about which winds to worry about most: we thought winter gusts were the ones to avoid, but it turned out that prevailing Spring and Summer winds were a bigger deal in hampering effective orientation, and increasing the energy cost of each foraging excursion. We noticed that even light winds accentuate drift to the end-most colony in our row.

In 2015, PLOS ONE published

a paper by Dr. Tarpy's lab at NCSU (Youngsteadt, Appler, López-Uribe, Tarpy, and Frank. November 2015. Urbanization increases pathogen pressure on feral and managed honey bees, **http://tinyurl.com/pfvunhc** that I read then and to which I often refer. The researchers observe that many urban colonies share patches of forage and may travel longer distances around their hives to find it: "poor habitat quality within this radius would impose additional stressful, above-average flight distances." That average distance is 1,500 meters. If you look at the photo here of the ridge on the other side of the plant, that is about 900 meters away. Yikes.

Even though our roof was far lower than many residential and commercial buildings with booming apiaries, the geography of this huge plain by a river required its own calculus, and we had to learn how to do the math. Now, we are moving the entrances to the more sheltered side to see if this helps with orientation and drift, and we are watching the end colonies more preemptively for swarming. We re-balance strength by moving capped brood to the colonies which appear to be donating foragers. New colonies are going to be fed longer and more. Pollen patties will be more frequently on the menu. We're getting an anemometer and a hive scale.

At this industrial location, we just have to get everything *more* right, or figure out how to get everything to a higher standard, than a beekeeper in a more typical or better understood environment. We also doubt that all locations are created equal, or that these special problems are going to be universal. We must be humble, we should pay lots of attention, we must worry more. It had better be worth it!

When we did get our harvest, the shared power of the apiary, the organization, and the community was intoxicating and hopeful. The kids closed the loop on learning that started with dissecting flowers in the Fall, moved through bee biology, and ended with honey spun out of frames they uncapped. Beekeepers, teachers, parents, and wastewater professionals helped kids crank extractors and dribble honey into bears. No one will forget the human connection, and they certainly won't forget the bees. For such a reward, it is *on us* to make this work even better for the bees, and I hope it has helped pay our debt to them.

Drift.

Why have I asked you to read about all these ins and outs of just one unusual apiary? Because as more of us become urban beekeepers, and compete for little chunks of real estate, some of you are likely to find locations that are even more unique and untried. Please think both technically and philosophically about it, get even more information up front, and make sure that the challenges facing the bees are as important to you as the challenge in getting an apiary. Taking high losses in the name of a headline is torturing bees, and I'll stop if I can't reliably ensure their survival. There is a theme in city beekeeping that sounds like, "If you can make it there, you'll make it anywhere," but the key to success is not being a star. Instead, find a sustainable way in a complicated and unfamiliar environment. When we carefully figure out how to work our bees in more places where humans are, it's a source of hope that we might make this increasingly crowded world work, too. BC

Toni Burnham keeps bees and helps new beekeepers get started in the DC area.

Blue Plains Ridge.

CALENDAR

♦INTERNATIONAL♦

Beekeeping Tour to Cuba November 11-19 featuring visits to apiaries, processing plants, research centers and more.

Contact Transeair Travel if your are interested in more details, 202.362.6100 or Blubic@TranseairTravel.com.

45th Apimondia International Congress will be held September 29 to October 4 in Istanbul, Turkey.

For more information visit **www.apimondia2017.org**.

♦CALIFORNIA♦

Western Apicultural Society (WAS) will held at the University of Davis September 5-8.

Dr. Norm Gary will be participating. Other speakers include Eric Mussen, Brian Johnson, Elina Niño, Serge Labesque.

Watch the web page for updates, details and registration, **www.westernapiculturalsociety.org**.

♦CONNECTICUT♦

Back Yard Beekeepers Association 2017 speaker schedule – September 26, Tom Seeley; October 31, Kirk Webster; November 14, Jennifer Berry.

For information visit **www.backyardbeekeepers.com.**

♦GEORGIA♦

Georgia and Southeastern Beekeepers will will welcome Randy Oliver, October 6-7 in Griffin, GA for the Fall statewide meeting.

Other speakers include Jennifer Berry, Rusy Burlew, Keith Delaplane, Tammy Horn and Kerry Owen.

Visit **https://gbal17.wildapricot.org/event-2540629**.

♦ILLINOIS♦

Northern IL Beekeepers Association will present a day with Tom Seeley, September 9 in the Leucht Conference Center of McHenry County College, Crystal Lake.

Dr. Seeley will be speaking on his latest two books *Honeybee Democracy* and *Following the Wild Bees*. The meeting is free with lunch on your own.

For more information visit **NIBAinfo.org**.

♦NEW YORK♦

Narrowsburg Honey Bee Festival will be held September 23 in Narrowsburg from 11:00 a.m. to 5:00 p.m. with a variety of events including bee experts, local and mead tasting, a parade and more for the whole family.

The festival is free and open to the public.

Visit **www.narrowsburghoneybeefest.com**.

Long Island Beekeepers Club will host Debbie Delaney September 24, 2:00 - 4:30 p.m. at Smithtown Historical Society Frank Brush Barn, 211 East Main Street, Smithtown.

Debbie Delaney Assistant professor of Entomology at the University of Delaware.

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

♦OHIO♦

East Central Ohio Beekeepers Association's event of 2017 will be held September 23 at Zanesville Eagles, #302 Conference Hall, 1275 Market Street, Zanesville, 9:00 a.m.

Speakers include Diana Sammataro, Gary Reuter and Keith Delaplane.

For information contact info@e-coba.org.

Annual HoneyFest, presented by the Ohio Parks and Recreation Association, September 16, Delco Park, Kettering, 10:00 a.m. to 5:00 p.m.

Visit with local Ohio beekeepers, honey vendors, educators and more at this FREE event.

For information contact h**abitatcenter@ketteringoh.org** or 937.296.2477.

The Ohio State University Bee Lab Webinars are held the third Wednesday of the month at 9:00 a.m. EST.

August 16: Viruses in Honey Bees – Reed Johnson.

To join a webinar follow the link and log in about 8:55 a.m. – http://go.osu.edu/theOSUbuzz.

♦WEST VIRGINIA♦

WV Beekeepers Association Fall Conference Celebrating their 100th anniversary, will be held September 22-23 at the Robert H. Mollohan Building at the High Tech Center in Fairmont.

Speakers include Alex Zomcheck, Joe Kovaleski and more. The cost for early registration is $35/members which includes Saturday lunch. After August 31 $45. Non-member early registration is $42 or $12.50 for Friday only.

For information contact **www.wvbeekeepers.org.**

♦WASHINGTON DC♦

17th Annual North American Pollinator Protection Campaign International Conference will be October 17-19 at the American Farm Bureau Federation, 600 Maryland Ave., SW, Ste 1000 W.

Speakers include Sam Droege, Jeff Pettis, Tammy Horn, Craig Regelbrugge, Deirdre Remley, Jane DeMarchi, Mary Phillips and Danielle Downey, Pete Berthelsen, Zac Browning.

Visit **kr@pollinator.org; www.NAPPC.org.**

♦WASHINGTON♦

The NW District Beekeepers Association will host Randy Oliver, September 9 at Everett PUD Auditorium, 2320 California Street, Everett, from 1-5;pm.

The cost is $25 and seating is limited. Tickets can be purchased at **www.brownpapertickets.com** by searching for Randy Oliver.

Contact Mike Kossian, **MikeKossian@hotmail.com**.

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American Bee Journal....92
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Farming Magazine....17
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WAS 2017....8
Wicwas Press....7

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Forest Hill Woodworking....85
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Pierce Uncapping....76
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Draper's Pollen....102
Fixit Hive Repair....92
FormicPro....37
Global Patties....16
GloryBee....19,68
Good Food Awards....70
Help Wanted....40
Hive Tracks....76
MISCO Refractometer....79
MiteAway Quick Strips....42
Mother Lode Products....70
Natural Apiary....58
Nite Guard....68
Nozevit....74
OxaVap....55
QSI Bee Products Analysis....82
R. M. Farms....102
Root Candles....61
Thymol....82
Varroa Cannon....31
Veto Pharma....52
Z Specialty Food....56

Seeds & Plants
Ernst Seeds....88
Rockbridge Trees....90

Suppliers
Acorn Beekeeping Equipment....6
Beeline Apiaries....67
BetterBee....24
Blue Sky Bee Supplies....Ins. Back
Brushy Mountain....63,Ins. Front
Dadant....10,27
JZsBZs....88
Kelley Beekeeping Co.....21
Mann Lake Supply....41
....Back Cover
Maxant Industries....85
Meyer, A.H.....67
Miller Bee Supply....64
Queen Right Colonies....88
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Liquid nitrogen is very cold – between -320° and -346°F. And it's not cheap, but Katie Lee told me you never have to waste any, because you can always use it to make ice cream!

Katie flew into Grand Junction, Colorado, where I picked her up. After breakfast we stopped off at a liquid nitrogen filling station. She unzipped her suitcase and pulled out an insulated aluminum 30-liter vessel called a "Dewar." Katie said it got some attention from the TSA folks.

The cheerful Airgas attendant said he'd seen a lot of things but never a Dewar packed into a suitcase. He filled it with liquid nitrogen, and I tied it onto the bed of the pickup. Katie warned me beforehand that you don't travel with liquid nitrogen in a passenger car. "What if we got in a wreck?" she said.

Katie came to the Colorado State Beekeepers Association (CSBA) bee college from the University of Minnesota to teach us about hygienic bees. Hygienic honey bees remove *Varroa* mites from brood cells and from each other, so this is a very good trait for your bees to have! They also remove from the hive diseased material, including chalk brood and American Foulbrood (AFB) deposits.

On the way back to the farm in New Castle, we stopped off at Paul's beeyard. Katie and I opened up two hives, and from each we removed a frame of sealed brood. Into this solid or nearly solid brood patch we inserted the end of a four-inch-long chunk of three-inch-diameter plastic PVC pipe. We stuck the PVC pipe down into the brood, twisting and pushing it all the way against the plastic foundation. We then laid the frame horizontally on top of a hive lid, with the PVC pipe sticking up out of it.

Next we poured a little liquid nitrogen into the pipe, to check for leaks. Finding no leaks, we proceeded to fill the pipe with nitrogen. In a few minutes the liquid nitrogen in the pipe boiled off, leaving behind a three-inch circle of frozen dead brood. Done for the day! Now we had to wait 24 hours to see how efficiently the bees cleaned out the dead brood.

When we came back the following day, with the entire bee college in tow, we examined these same frames of brood. In one, the bees had removed virtually all of the dead brood, indicating excellent hygienic behavior. In the other, only half the dead brood had been removed. Not so good!

After Katie showed the results of the test to the bee college participants, she demonstrated how she froze the brood to set up the test. So now we had two more frames with frozen brood. She and I came back the following day to see what we might learn. Results: two more frames of dead brood 100 percent or nearly 100 percent cleaned out, indicating excellent hygienic traits.

We were on a roll! Next we did tests on two hives at the farm. Results: two more hygienic hives. These bees came from a California breeder who each year sells me queens that are prolific and hardy, but I had never before gathered data that might document their resistance to *Varroa* mites. Since Katie explained that only about ten percent of hives carry the hygienic trait, my two tests gave me reason to believe that many of my California queens might produce hygienic offspring.

To summarize, five of six colonies tested positive for hygienic behavior, including three of four belonging to Paul. Since Paul's drones dominate the landscape in this part of Colorado, and since he buys queens that are purportedly hygienic, we may have something going here.

This is a very big deal. Of the plethora of challenges facing our little darlings, mites are one problem that we beekeepers, individually, can impact. We can't necessarily control our bees' access to good forage, or their exposure to chemicals, but we can and should reduce their stress from Varroa.

Meanwhile, as Katie gave her demonstration to half the attendees, Paul lectured in front of the honey house to the other half. He showed off frames of AFB, European Foulbrood (EFB) and chalk brood. You can't get this kind of education out of a book. With AFB, you have to see it, touch it, smell it. Once you recognize AFB, you don't have to send off samples to some bee lab to confirm your diagnosis. You'll know. I can sometimes smell AFB from ten feet away. You need to be able to identify AFB, and you need to deal with it. There's more than one way. But recognizing it is the first step.

After all this learning under a hot June afternoon sun, we clung to the shade next to the honey house. As Katie made liquid nitrogen ice cream, I sensed there was no way I was going to herd these wilted beekeepers 300 yards across the property to a classroom set up for a CSBA general meeting. So I stood up on a chair right there in the shade and called the meeting to order.

It was a rewarding day, an informative bee college, a spectacular banquet following. The gal Marilyn and I got to have Katie with us at the farm for the weekend. Damn! Life can be good.

Ed **Colby**

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$10.45/12 ct.
includes
Gold Metal lids

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8 oz - $19.99/50 ct. Case
16 oz - $23.99/50 ct. Case
32 oz - $39.99/50 ct. Case
No Caps

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HopGuard® II

A Highly Effective, Natural Varroa Control System

HopGuard® II, an effective miticide, is derived from hop compounds and provides the beekeeper with a natural, safe and easy-to-use alternative to traditional harsh chemical control agents.

- **Natural, food-grade product**
- **No negative effects on egg laying and normal hive activity**
- **No residue in honey**
- **Naturally promotes bee health and survivability**
- **Safe for the bees, the beekeeper, and the environment**
- **Easy to use**

Each HopGuard® II kit contains 24 insert strips, ready for use. Simply add HopGuard® II to brood frames, 2 strips per 10 frames. HopGuard® II may be applied up to three times per year, ***even during the honey flow.***

HopGuard® II

12 treatments (24 strips)

1-9..... $48.95
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