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BEEKeeping

Autumn '19®

Your First Three Years

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Features

Getting ready for Winter.

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 – Amanda DeSimone, Amanda@BeeCulture.com, Ext. 3255
Advertising – Jean Newcombe, JNewcombe@BeeCulture.com, Ext. 3216
Publications Assistant/Subscriptions – Kelsey Kelly, kkelly@rootcandles.com, Ext. 3220
Design/Layout – Brenda Tharp Bray

Contributors

Ann Harman • David MacFawn

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

Subscription Information

U.S., one year, $20. Newsstand price: $6.99. All other countries, (U.S. Currency only), $20.00 per year. Send remittance by money order, bank draft, express money order, or check or credit card. BEEKeeping (ISSN 2475-4854), Autumn 2019, Volume 4, Issue 3, is published quarterly by The A.I. Root Co., 623 W. Liberty Street, Medina, OH 44256. Periodicals Postage Paid at Medina, OH and additional mailing offices.

Subscriptions, Book Orders – 800.289.7668, Ext. 3220 • www.Beekeeping3.com
Advertising – 800.289.7668, Ext. 3216; JNewcombe@BeeCulture.com

The Editor's Hive

It's over 80 degrees outside today, but it is today that I begin to worry about Winter for my bees, because Winter begins in July for you and your bees.

There's an old saying I made up a few years ago because *Varroa* mites changed the landscape of keeping bees. Take care of the bees, that take care of the bees, that go into Winter. Think of this like this....

If your grandparents aren't healthy they won't be able to take good care of your parents, and if your parents aren't healthy, they won't be able to take care of you, and if you're not healthy, you won't make it through the Winter. So, take care of the grandparents, and that starts in late July into early August.

If you think of this as three generations, then you have about 60 some days to take care of business and get your bees' house in order. That means, by early October your hives should be well stocked with overwintering food, both honey and pollen, and have pests and diseases well under control.

We'll get to those pests and diseases in a moment, but let's look at food first. How much honey will your colony need to get from first frost in the Fall to last frost next Spring where you live? Say, Octoberish to Aprilish? If you live south of the Mason Dixon line, any honey flows ceased about a month or so ago, so you have an even longer time to support your bees without any outside influence from blooming crops.

So, how much honey will you hives need? I tend toward the conservative, meaning I try and plan for an early first frost and a late last frost, so my plans include the longest possible time that there will be no honey coming in. Better safe than sorry, or dead, is my plan. So, I aim for at least, at least 100 pounds of honey on those hives August 1. That's after I've removed everything I'm going to harvest, and all that's left is for the bees. So if you are using standard 10 frame equipment figure the bottom board, two deeps with frames and brood and bees, inner cover and cover, should come in at about 60 pounds or so. If you don't think this is accurate, try the weighing method below for just bottom board, two deeps with drawn frames, inner and outer cover as individual pieces. Get that weight, write it down.

Then, take a full frame of bees, brood, honey and pollen from a hive and weigh it. Make a sling out of a loop of twine that holds the lugs on both ends of a frame with enough slack to get the hook from the scale under it, get the weight, write it down, multiply by frames, both full and partially full (get a percent and use that as the weight) and write it down, and add, and there you have the total for a hive. Given that there probably isn't much honey in all of those frames combined, assume that honey weighs zero. This technique works for top bar frames to, when weighing just the honey frames.

So how do you weigh a hive, outside, full of bees and whatnot? It's easy, really. Get a Spring scale. You know, those kind of scales that have a hook on the bottom, and a handle on top, with the scale face in between. Put the hook underneath the bottom board on the front of the colony and lift. Write down the weight. Do the same for the back, write it down, add the two numbers and you have the weight of the colony. With that 100 pounds of honey, it should come in at a generous 150 pounds. That's a lot... but then, what did that package cost you last Spring?

If it's less. Feed. Feed frames of honey from your own bees first if you have them, if not, sugar syrup, in a 2:1 sugar:water mix. Even 3:1 if you can. And remember, weigh the sugar, not the sugar syrup. Get them to store the weight of the sugar you need to come to that 150 pounds or so. And weigh occasionally just to make sure.

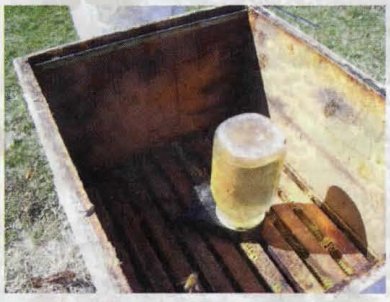
Pests. Of course, there are pests

Continued on page 41 ⇨

1ST YEAR HIVE TASKS

Ann **Harman**

- October First is Mouse Guard Day. Don't neglect to put them on.
- Egg-laying diminishes during these next months.
- The broodless time is perfect for *Varroa* treatments of your choice until daytime temperatures are below 57°F.
- Bees start forming a cluster at 57°F. Do not disturb the cluster.
- Unless in a hot climate, small hive beetles stop reproducing.
- Check each hive for adequate Winter stores.
  - Warm climate 40 pounds
  - Temperate climate 60 pounds
  - Cold climate 90 pounds



- If colonies are disease-free, frames of stored honey can be moved to provide adequate Winter stores. Watch carefully so you do not move the queen!
- For Winter stores, liquid syrup mix is slightly less than 2 parts sugar to one part water.
- No liquid syrup feeding when temperatures are below 57°F.
- Do not leave queen excluders on the hive between hive bodies. Remove for cleaning on a cold day. Wax will snap off. Do not damage in cleaning.
- Inspect queen excluders for damage and discard. The queen will find a bent rod or torn plastic.
- Inspect all equipment for damage. Set aside for repair—or—fix it now!

- Warmer Autumn months are good for repainting.
- Inspect stored comb for damage, excessive drone comb or lumps of cross-comb.
- Protect all stored equipment, including plastic queen excluders, from mice. Check during Winter months.
- Woodenware and brood comb can be placed in plastic bags and frozen for a week to kill wax moth eggs. Leave bagged and protect from mice.
- Clean up the beeyard. Remove discarded pieces of equipment.
- Clear hive entrances of weeds and grass so bees can take cleansing flights.
- Check the electric fence if you live in bear country.
- Wash all bee clothing—veils, jackets, coveralls, gloves. Replace household gloves with new ones.
- Clean up your smoker. Make sure it is free of ashes under the grid.
- Check on hives once a month to see if food stores are adequate. Do not break the cluster!
- If you harvested honey this year use it in cooking, especially during the holiday season.
- Read beekeeping magazines and bee books.

learn more at: **bit.ly/Honey_Straw_Filler**

NEW

All honey producers are familiar with Honey Sticks as a great way to increase sales and margin, but they are also aware of the downside - which is that these sweet natural treats do not usually contain the producers' own, Locally Produced honey. As beekeepers, Anthony's Beehive wanted to offer a solution to that dilemma - so we designed and built a tabletop machine to quickly and easily fill standard drinking straws with honey or other liquids, even gels.

This machine uses centrifugal force to fill 36 straws at one time. The process can be a bit sticky, but the process is easy to learn and very effective. The honey does not need to be heated and there is enough force to fill straws with creamed honey or honey with additions such as small seeds or pieces of fruit. The machine is easy to clean and there is very little waste when changing from one flavor to another.

Details and video are available at: **http://bit.ly/Honey_Straw_Filler** or at **www.AnthonysBeehive.com.**

We, Jeannie and Saum and Laurie and Peter Dotson, are beekeepers and bee-lovers. We have established BEEpothecary, LLC, to hand-craft quality health supplements, skin care products, shaving products, soaps, and candles with honey bee resources.

BEEpothecary harnesses the amazing, researched-based benefits of bee propolis, honey, beeswax and pollen, in our products. We round them out with other natural, foodgrade oils and butters, herbs and essential oils. We grow and harvest many of our own ingredients. We use no artificially made chemicals. Our dietary supplements are produced in an FDA/ODA certified production space.

Our products are different from others on the market because we add bee propolis to just about everything we create. Bee propolis is the secret to our brand's success, and its use and effectiveness for human health is backed up by over 70 years of research from around the world.

You can peruse the research at our blog site, BEEpothecary.wordpress.com, by clicking on the Propolis tab or searching the blog entries for information on the various beehive resources. Find out what the power of bees can do!

Our products include: Dietary supplements for your Health: Propolis oil, Tincture, Nasal Spray, Throat Spray and just out, Raspberry and Bubble Gum Flavored Propolis Oils; All Natural Skin Care Products: BEE Rescue Cream, BEE Intense Body Cream, Rejuvenae Facial Cream and Gourmet Flavored Lip Balms; Men's and Women's Shaving Products: Pre-Shave Oil, Hot Lather Shaving Soaps, Beard and Stache Oils and Wax, and Aftershave Creams; Goat's Milk Bath Soaps with beeswax, honey, herbs and propolis. Various Honeys: Raw Ohio Honey, Propolis Honey, BEE Bread (pollen in honey), BEEhive Delight (Pollen and propolis in honey),Creamed Honeys - Regular, Cinnamon, and Chocolatte Beeswax Items: pure, strained beeswax in 1 oz ingots, 1 lb blocks, beeswax candles.

Products can be seen on our online market at BEEpothecary.us

Check out our new gift sets. Health ~ Powered by BEES!

⇨

NEW TOO

Bees and Man. 70 Short Stories. William Michael Hood. 196 pgs. 6" x 10". Color throughout. ISBN 978-1-912271-45-0. Published by Northern Bee Books. $30

Mike Hood (he's only been Mike as long as I've known him), is Professor Emeritus Entomology from Clemson University in South Carolina. He retired in 2013. While at Clemson he was Extension Honey Bee Specialist and the State Apiarist. He's taught beekeeping, IPM including research on tracheal mites, *Varroa* and small hive beetle. He published a book on SHB a couple of years ago available from most bee supply companies.

His new book draws on his years of exposure to bees and people, and all the odd, weird, neat, necessary, and extraordinary things that happen when bees and people are in the same place at the same time.

He looks at what he calls Odd Bee Stories, including bees spotting parking lots, some of his research with bees, dealing with bees being out of place, bees and animals, bee city and chiggers in the beeyard. But he deals with more than honey bees – yellow jacket nests can be both exciting and scary, as can bald faced hornets. And of course swarms, where they do, and don't go and why.

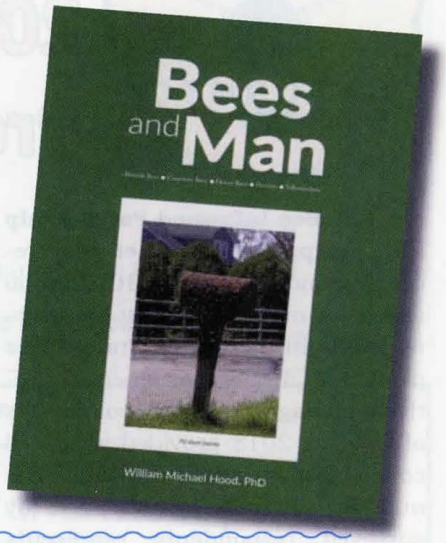
His role as State Apiary Inspector probably led to what I thought were his most interesting stories – beekeepers he has met. Famous, and infamous, well known and not known outside their county, rich and not so rich, and more and more. This is, in my opinion, the best reading in the book. Many of these folks are gone, or have stepped away from public life and it is good they are remembered here. Steve Taber, Laurence Cutts, Burt's Bees, Fred Deer, Huck Babcock – the list goes on for this Who's Who chapter.

Basic beekeeping information and education has a place here too – equipment to use, and not use, where to put hives, a lot about stings, honey bee plants, and some about African honey bees in SC. And of course a lot about honey bee products – propolis, honey, wax, lotions and potions, pollen, apitherapy and other products you may, or may not choose to explore.

The book winds up with a chapter on Tall Tales. If you've ever been to a bee meeting that featured tall tales you know how outlandish some of them can get – and still be true. Pet catfish, peg legged pigs, and more. I only wish he had more of them.

The greatest value of this book of course is that it gives a human face and name to some of the more colorful individuals in our industry that too often become lost in the smoke of our everyday beekeeping. Thanks Mike.

Kim Flottum



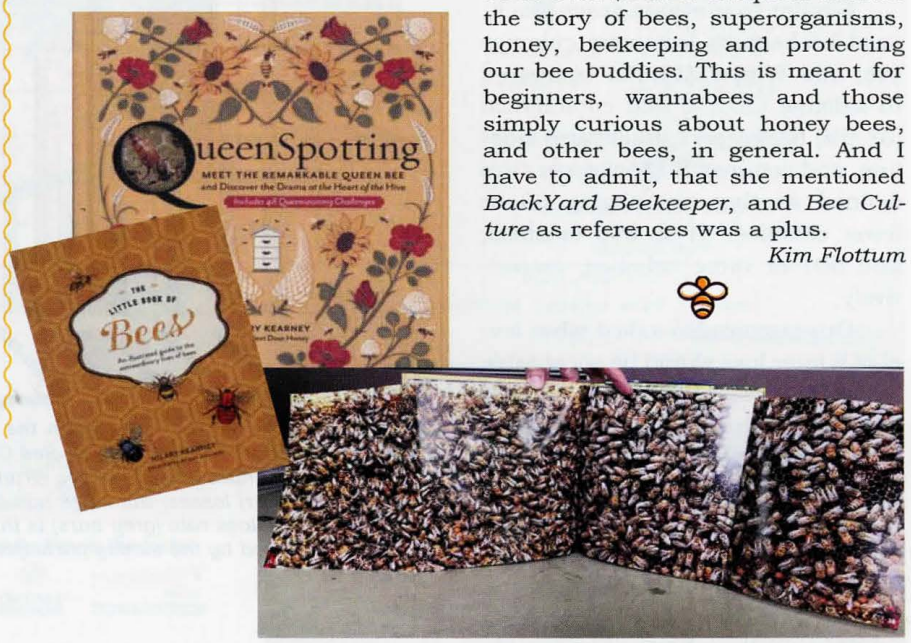
Queen Spotting. By Hilary Kearney. Published by Storey Publishing. 127 Pgs. Hard cover. Plus many multiple page foldout sections. All color. 7" x 8" ISBN 9781635 860375. $19.95

We have two books by this author this time. *Queen Spotting*, and *The Little Book Of Bees*. My thought was that this very busy author, who runs Girl Next Door Honey, had the same idea I did when I saw the two together – Christmas is right around the corner, and these two books are ideal as gifts for both wannabees, beginners and even experienced beekeepers.

Queen Spotting is a book about just that – finding queens. Four chapters, each with several multiple page foldout pages full of bees (see the photo) – Inside a colony, with both easy and intermediate hard to find queens, Life of the queen bee, with intermediate and advanced hard to find queens, and How to spot the queen, with difficult to find queens. All of these queens are on full pages of bees on comb. Some are one page, some two and some even four. Find the queen. Great practice for next spring when she's moving. Good information on queen biology and bees in general. A great gift.

The Little Book Of Bees by the same author is published by Abrams Publishing. It is little, 5" x 7" but it has 223 pages with lots of photos and drawings and a hard cover with color all over. ISBN is 978-1-4197-3868-5 for $16.99. Chapters include the story of bees, superorganisms, honey, beekeeping and protecting our bee buddies. This is meant for beginners, wannabees and those simply curious about honey bees, and other bees, in general. And I have to admit, that she mentioned *BackYard Beekeeper*, and *Bee Culture* as references was a plus.

Kim Flottum



Honey Bee Colony Losses 2018-2019 – Preliminary Results

The Bee Informed Partnership (BIP; **http://beeinformed.org**) recently conducted the 13th annual survey of managed honey bee colony losses in the United States. This past year, 4,696 beekeepers collectively managing 319,787 colonies as of October 2018 provided validated colony loss survey responses. The number of colonies managed by surveyed respondents represents 11.9% of the estimated 2.69 million managed honey-producing colonies in the nation (USDA, 2018).

During the 2018-2019 Winter (1 October 2018 – 1 April 2019), an estimated 37.7% of managed honey bee colonies in the United States were lost (Fig. 1). This loss represents an increase of 7 percentage points compared to last year (30.7%), and an increase of 8.9 percentage points compared to the 13-year average Winter colony loss rate of 28.8%. This year's estimate is the highest level of Winter losses reported since the survey began in 2006-2007.

Similar to previous years, backyard beekeepers lost more colonies over the Winter (39.8%) compared to sideline (36.5%) and commercial (37.5%) beekeepers. Backyard, sideline, and commercial beekeepers are defined as those managing 50 or fewer colonies, 51 to 500 colonies, and 501 or more colonies, respectively.

Our survey also asked what level of Winter loss would be acceptable by beekeepers. Interestingly, this revealed an increase from 20.6% last year to 22.2% this year, which is much greater than the 11-year average of 17%. This increased acceptable loss may indicate that beekeepers are more realistic or pragmatic in their expectations of colony losses. Even with a higher acceptable loss, sixty-two percent of responding beekeepers lost more colonies than the level deemed acceptable.

During the Summer 2018 season (1 April 2018 – 1 October 2018), an estimated 20.5% of managed colonies were lost in the U.S. This level is slightly higher (3.4 percentage points) than the previous Summer's colony loss estimate of 17.1%, but is on par with the Summer loss average reported by beekeepers since 2010-2011 (20.5%), when Summer losses were first recorded by the BIP.

For the entire survey period (1 April 2018 – 1 April 2019), beekeepers in the U.S. lost an estimated 40.7% of their managed honey bee colonies. This is similar to last year's annual loss estimate of 40.1%, but slightly higher (2.9 percentage points) than the average annual rate of loss reported by beekeepers since 2010-11 (37.8%).

We note that loss rate for each period was estimated by identifying the total number of at-risk-colonies that died, and that annual loss rate was not estimated by summing the individual Summer and Winter loss rates. This year's state-specific loss rates will be added to previous years' results on the BIP website shortly (**https://bip2.beeinformed.org/loss-map/**).

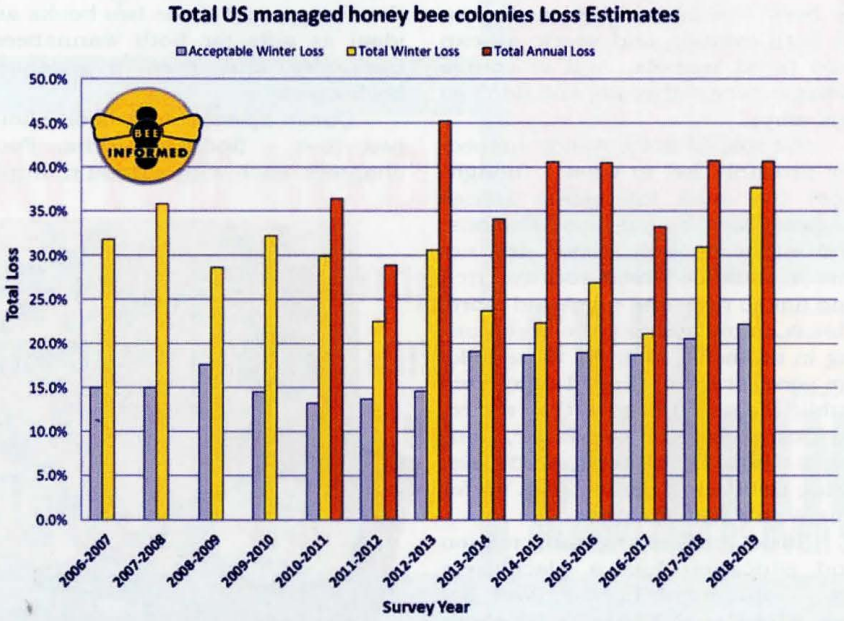
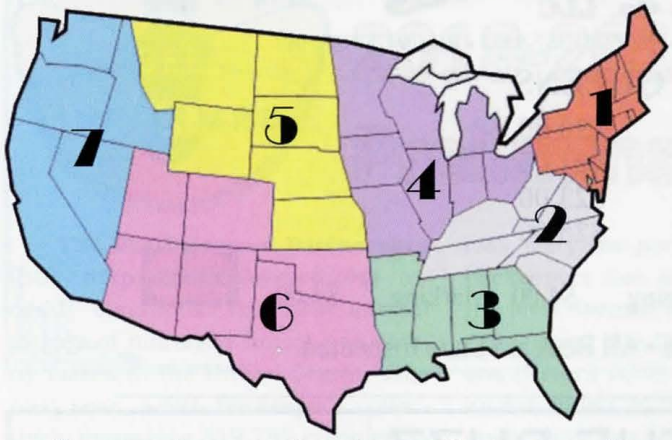


***Fig 1**. Total Winter colony loss rate in the United States across years of the Bee Informed Partnership's National Honey Bee Colony Loss Survey (yellow bars; 1 October – 1 April). Total annual loss estimates (orange bars) include total Winter and Summer (1 April – 1 October) losses; the latter has been estimated since 2010-2011 only. The acceptable Winter loss rate (grey bars) is the average percentage of acceptable Winter colony loss declared by the survey participants in each year of the survey.*

AUTUMN REGIONAL HONEY REPORT



	% Important						% Less Important					
	2014	2015	2016	2017	2018	2019	2014	2015	2016	2017	2018	2019
Price	53	55	59	66	60	61	47	45	41	34	40	39
Label Design	49	35	38	45	40	34	51	65	62	55	60	66
Name on Label	64	60	71	71	73	63	36	40	29	29	27	37
Local Honey on Label	77	66	61	55	55	60	23	34	34	45	45	40
Variety of Honey/label	19	24	23	25	20	25	81	76	77	75	80	75
Second Label	8	9	14	18	18	16	92	91	86	82	82	84
Location I sell	58	54	58	66	61	54	42	46	42	34	39	46
Time of Year	28	17	23	29	31	23	72	84	77	71	69	77
Glass Container	31	36	35	40	37	32	69	64	65	60	64	68
Plastic Container	17	19	14	16	13	18	83	81	86	84	87	82
12 oz. size	35	32	38	38	43	30	65	68	62	62	57	70
1 lb. size	60	55	48	56	62	59	40	45	52	44	38	41
2 lb. size	55	37	35	42	52	43	45	63	65	58	48	57
5 lb. size	42	36	23	27	40	26	58	64	77	73	60	74
Quart jar	45	44	45	44	46	42	55	56	55	56	54	58
Pint Jar	40	36	41	36	31	29	60	64	59	64	69	71
Specialty Jar	13	13	11	10	16	6	87	87	89	90	84	94
Gallon	-	24	15	11	25	20	-	76	85	89	75	80
Raw	-	67	67	64	67	67	-	40	33	36	33	33
Color	-	27	41	26	30	26	-	73	59	74	70	76
Other Products	-	-	2	8	13	16	-	-	98	92	87	84

For several years we have been polling our reporters on the techniques and designs they use to promote and sell their honey. Marketing isn't Rocket Science, but it does take some planning and a bit of investment to make your product both get the attention it deserves, and to stand out in the crowd if it's on a shelf with a dozen other bottles.

You can follow any trends in these and see changes, or not, over time. A couple we'd like to point to are the fact that price isn't all there is to selling honey, but it is important. Label design is less important than one might expect, and additional labels seem to not be important at all, or hardly anyway.

However, what is on the label seems, in some cases to be important. Raw and local have been important, while what variety is still not a strong component.

One thing beekeepers tell me who do a lot of one on one selling – think farm markets – is that a lot of customers don't know what Raw means, nor does Local have a good definition. A sign explaining all this is helpful they say, or a map defining where local actually is helps too. Once a customer sees this and has it explained, the next time they will know and know to ask if they don't see it. We've said before, you have to tell to sell, and this is the best opportunity you have, when you are there, and more importantly when you aren't.

One other item to note. Take a look at the $/lb column and how much you are selling your honey for in what size container. Hands down, a half pound retail container is your MOST profitable size – this month almost $10/lb, compared to $2.07/lb in a barrel. What are you putting on the shelf makes a difference....bigger does not always mean better.

REPORTING REGIONS								SUMMARY			History	
	1	2	3	4	5	6	7				Last	Last
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS								Range	Avg.	$/lb	Month	Year
55 Gal. Drum, Light	2.10	2.21	2.23	2.38	2.34	2.03	2.10	1.05-3.00	2.17	2.17	2.22	2.23
55 Gal. Drum, Ambr	2.00	2.15	2.16	2.35	2.00	1.87	2.00	1.35-2.50	2.07	2.07	2.14	2.08
60# Light (retail)	209.85	186.40	177.50	186.94	155.00	196.79	220.00	105.00-325.00	204.69	3.41	212.92	195.46
60# Amber (retail)	214.70	188.67	191.25	184.44	214.70	189.46	228.33	119.74-325.00	207.03	3.45	211.64	192.47
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	95.14	75.50	101.51	74.80	61.20	90.00	95.14	57.60-144.00	89.49	7.46	91.23	87.71
1# 24/case	140.81	125.32	135.45	108.69	134.00	147.66	136.20	86.40-211.20	132.82	5.53	130.13	126.79
2# 12/case	125.20	96.58	119.08	101.20	111.84	116.40	114.00	78.00-192.00	115.39	4.81	120.90	112.61
12.oz. Plas. 24/cs	111.46	101.17	100.00	91.25	83.76	110.32	103.20	66.00-175.00	102.41	5.69	104.66	99.52
5# 6/case	130.46	110.06	122.83	124.70	113.16	132.00	130.46	52.99-210.00	129.43	4.31	135.08	128.77
Quarts 12/case	159.63	154.16	136.80	142.80	151.23	169.71	144.00	109.20-222.00	153.66	4.27	158.64	151.89
Pints 12/case	110.41	93.70	83.25	82.00	111.00	90.04	84.00	60.00-192.00	94.81	5.27	90.70	99.52
RETAIL SHELF PRICES												
1/2#	5.21	4.63	4.51	4.44	3.89	4.72	6.38	1.98-9.00	4.92	9.85	4.95	4.94
12 oz. Plastic	6.96	6.14	5.66	5.01	4.58	6.25	5.90	3.50-12.00	6.17	8.22	6.09	6.12
1# Glass/Plastic	8.05	7.54	7.66	6.45	6.67	7.23	9.88	2.50-14.00	7.86	7.86	7.79	7.46
2# Glass/Plastic	13.98	12.61	13.36	11.23	11.75	11.66	15.25	6.70-23.00	13.11	6.55	13.52	12.51
Pint	12.32	10.83	9.21	8.73	10.63	9.98	10.80	6.00-22.00	10.65	7.10	10.33	10.22
Quart	21.36	17.33	15.81	15.21	17.62	18.32	18.86	9.00-40.00	18.21	6.07	18.14	17.88
5# Glass/Plastic	30.06	27.85	37.24	26.17	24.93	23.72	30.06	15.89-48.00	28.18	5.64	29.14	26.43
1# Cream	10.41	8.57	8.00	8.70	10.24	7.75	9.67	6.00-16.00	9.82	9.82	9.89	9.40
1# Cut Comb	13.50	12.99	10.39	9.60	12.67	11.25	14.00	6.00-24.00	11.99	11.99	11.51	11.61
Ross Round	9.89	7.40	9.89	9.89	9.89	10.50	12.49	6.00-13.50	10.02	13.36	9.52	9.33
Wholesale Wax (Lt)	8.16	4.78	5.75	5.77	6.13	6.30	10.50	3.00-16.00	6.81	-	6.64	6.44
Wholesale Wax (Dk)	5.55	4.38	4.18	4.17	5.55	3.00	5.55	2.00-10.00	5.10	-	5.23	5.77
Pollination Fee/Col.	95.61	77.17	71.67	90.00	95.61	95.00	67.50	50.00-160.00	86.22	-	92.39	86.96

Coming Up Work To Do

Welcome to COMING UP, where our Honey Reporters share a line or two about what they will be doing over the next few months with their bees. Advice is given for each region so you can see what others are doing where you are, and, of course in all the rest of the regions. Check these out. These reporters are successful in business.

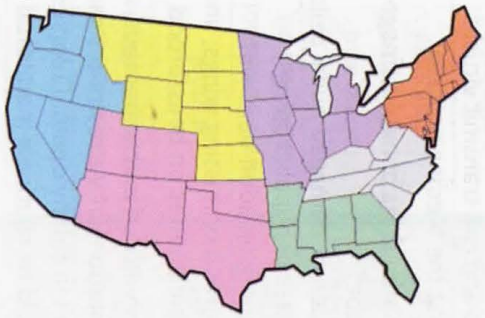
Region One
- Pull off honey
- Start to feed bees for Winter
- Mite control
- Check Stores in hive for Winter
- Leave the Fall flow for the long Winter
- Remove supers
- Medicate
- Check weight of hives
- Feed if lite
- Re-queen
- Feed sugar syrup
- Prepare for Winter
- Remove honey supers

Region Two
- Check for food store and feed if necessary
- Do a mite count and treat if necessary
- Clean up yard
- Check Queens
- Splits
- Feed- Dearth at this time and last month
- Downsize
- Finish mite treatments
- Feed heavy sugar syrup and combine weaker colonies
- Check for disease
- Add supers
- Check foods stores and remove honey supers

Region Three
- Late mite treatment
- Check food
- Ensure enough food
- Mite check and control
- Make sure they have enough stores
- Harvest honey
- Determine status of each hive
- Check and replace Queen as needed
- Start feeding to build Winter population
- add DFM

Region Four
- Super the hives
- Pull some comb honey
- Be sure queen is out of supers and in the brood boxes
- Mite treatment
- Feed for winter
- Check Queen health
- Re-Queen if necessary
- Combine weak hives
- Inspect your hive- verify egg, larva, capped brood, honey, pollen
- Feed supplements
- Leave extra honey

Region Five
- Keep checking mite counts
- Check brood patterns or Queen viability
- Treat for mites
- Combine
- Feed syrup and supplements



Region Six
- Feed
- Treat for mites
- Good water
- Harvest honey
- Add supers
- Remove all supers and put on supers or deeps for Winter
- Early fall oxalic acid vaporize treatment for all hives

Region Seven
- Control mites
- Feed
- Good Queens
- Check hive weight to determine if feeding is necessary
- Complete mite treatments
- Feed to stimulate egg laying

Honey Reporters Wanted

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

Meet The Varroa Mite...

The Varroa Mite, *Varroa destructor*, is an external parasite that attacks adult and immature stages (brood) of honey bees. These mites weaken bees and can transmit viruses during the feeding process.

Common signs of mite damage include:
1) open or damaged pupal cells;
2) holes in pupal cappings;
3) emerging adult bees with deformed or missing wings; and
4) visible mites on bees/brood.

Unmonitored and untreated infestations of Varroa mites can result in colony death. Colonies should be routinely monitored so informed management decisions can be made about population levels, treatment methods and efficacy. To obtain the best results, incorporate a range of the chemical and cultural Integrated Pest Management (IPM) methods listed in this brochure.

10 Steps To Doing An Alcohol Mite Wash

MATERIALS NEEDED:

- dishpan
- ½ cup measuring device
- ½ cup 70% rubbing alcohol
- mite wash jar

DIRECTIONS:

1. Inspect honey bee colony to remove a single frame that contains open brood and adult bees. Make sure the queen is not on the frame.
2. Shake worker bees from this frame into the dishpan.
3. Quickly scoop ½ cup of worker bees (~ 300 bees) from the dishpan and put into provided mite wash jar filled half-way with 70% alcohol.
4. Shake leftover live bees from the dishpan back into the hive.
5. Put the solid and mesh lids on jar and tightly seal.
6. Shake jar vigorously for 1-2 minutes to dislodge mites from submerged bees. Let jar sit for a few minutes to let mites dislodge.
7. Remove solid lid from jar, leaving mesh lid and tightly seal.
8. Pour the mixture of dead bees, mites and alcohol through the mesh lid over the empty dishpan to remove the mites and alcohol. Vigorously shake jar contents while pouring to ensure mites are dislodged.
9. Sift through the liquid debris to count the total mites. If the total number of mites ranges from 3-9, consider treatment options.
10. Discard bees. Alcohol can be re-used if mites are removed. Wash all re-usable materials after use.

MDAR
MASSACHUSETTS DEPARTMENT OF AGRICULTURAL RESOURCES
Division of Crop and Pest Services

maine Department of Agriculture Conservation & Forestry

Varroa Mite IPM

Integrated Pest Management (IPM) Options for Varroa Mites

NAME	ACTIVE INGREDIENT [CHEMICAL CLASS]	MODE OF ACTION	APPLICATION MATERIAL	APPLICATION SEASON & TEMPERATURE GUIDELINES	TREATMENT DURATION	KEEP HONEY SUPER ON?	NOTES
Apivar®	amitraz [amidine]	contact	plastic strip	Spring, Fall	42-56 days	no	honey supers put on 14 days after strip removal
Apistan®	tau-fluvalinate [pyrethroid]	contact	plastic strip	Spring, Fall [>50°F]	42-56 days	no	mite resistance shown; honey supers put on after strip removal
CheckMite+®	coumaphos [organophosphate]	contact	plastic strip	Spring, Summer, Fall	42-45 days	no	mite resistance shown; do not use for queen-producing colonies
Apiguard®	thymol	fumigant	gel or gel tray	Spring, Fall [60°F to 105°F]	28-42 days	no	Restricted Entry Interval (REI) of 48hrs; honey supers put on after gel removal
Api Life Var®	thymol, menthol, eucalyptus oil	fumigant	tablet	Spring, Summer, Fall [64°F to 95°F]	26-32 days	no	honey supers put on 30 days after tablet removal
Mite-Away Quick Strips® (MAQS)	formic acid	fumigant	gel strip	Spring, Summer, Fall [50°F to 85°F]	7 days or 21 days	yes	penetrates wax cappings; check queen vitality after treatment
Formic Pro®	formic acid	fumigant	gel strip	Spring, Summer, Fall [50°F to 85°F]	14 days or 20 days	yes	penetrates wax cappings; check queen vitality after treatment
Oxalic Acid	oxalic acid dihydrate	contact, fumigant	vapor or liquid	Spring, Fall	varies by application type	no	most effective when brood-less
HopGuard®II	potassium salt of hops beta acids	contact	cardboard strip	Spring, Summer, Fall	30 days	yes	most effective when brood-less
Screen Bottom Board	cultural, non-chemical options for management	varies depending on management type		Spring, Summer, Fall, Winter	all year	yes	check mite drop for effectiveness
Drone Brood Trapping/Removal				Spring, Summer, Fall	14-20 days	yes	remove comb/open drone cells before emergence
Brood Interruption				Spring, Summer	14-20 days	yes	split hive or allow to swarm; but capture swarm
Re-Queen/Cage Queen				Spring, Summer	28 days	yes	select mite resistant stock when available

Publication produced by the Massachusetts Department of Agricultural Resources (MDAR) and Maine Department of Agriculture, Conservation, and Forestry (MDACF), funded by the Northeastern IPM Center through grant #2014-70006-22484 from the National Institute of Food and Agriculture, Crop Protection and Pest Management, Regional Coordination Program, and reprinted with permission from the Northeastern IPM Center.

Northeastern IPM Center

USDA United States Department of Agriculture National Institute of Food and Agriculture

STRAIGHT OUTTA THE BEEYARD

David E. **MacFawn**

Moving a hive, whether within the same bee yard or miles away, is something that most beekeepers will encounter at some point in their beekeeping journey. Hobbyists may want to move a hive across the yard, while sideliners may find themselves moving bees to local crops or to spread out their hives to maximize forage. Commercial beekeepers may move bees from crop to crop following the needs of farmers seeking pollination services. Each scenario serves to accomplish a different goal and the methods used vary. Knowledge of the biology and behavior of the honey bee is essential in accomplishing a successful outcome.

Colonies may be moved for forage, if they are a hindrance in their current location, or for pollination. The destination location should always be assessed for forage and water as well as access for the beekeeper. You need to be able to drive your vehicle up to the back of the hives, even in inclement weather. When moving hives for pollination services care should be taken to ensure any additional honey or pollination revenue covers the cost of the move and travel necessary to service the hives at their new location. The greater the distance moved will result in an increase in costs to the beekeeper which must be offset by increased pollination fees or an increase in honey production. Sometimes a satisfactory combination of benefits can be found which benefits both the beekeeper and the landowner such as when permission for a permanent bee yard can be found in an area of good forage.

When moving a hive, especially in warm weather, greater than about 60F, care should be taken so that the bees do not overheat. To provide ventilation, close the entrance with #8 hardware cloth cut to the width of the entrance, folded and pushed into the entrance in place of an entrance reducer. Also use of screened bottom boards or a moving screen placed on top of the equipment stack. A moving screen should not be left on top of the equipment stack after moving since the bees will propolize it. If moving a hive in cold weather, less than about 40 F, a solid top cover should be used, and care taken that the bees do not get overly chilled. An entrance reducer, can be used to block the hive entrance during cold weather conditions.

When moving a hive, the bottom board should be attached to the brood chamber with a high-quality duct tape to prevent the bottom board and brood chamber from slipping apart. In moist climates where hive staples are used to join equipment where the staple is driven will become susceptible to rot. Consideration should also be given to using duct tape to join supers if they are not propolized to each other. The equipment stack should then be secured together with a moving strap and tightened securely. If the equipment is structurally sound, any holes in the equipment can be covered with duct tape when moving the hive. It should be noted if hive staples are used, your equipment will not last as long but the hive staples do work well to secure the boxes.

Figure 1 Moving screen on top of equipment stack for warm weather ventilation

As a simple, movable hive stand, I use three cement blocks with two eight-foot length landscape timbers on top (Figure 6). This height allows easy moving of the hive with a hand truck. Hand trucks with large wheels make the job easier, especially over bumpy terrain. Typically, I place a hive on each end of the hive stand with the middle space being used for placing supers, other equipment, and used when working the hives.

Figure 2 Securing bottom board to brood chamber with duct tape to move hive

The tongue of a hand truck

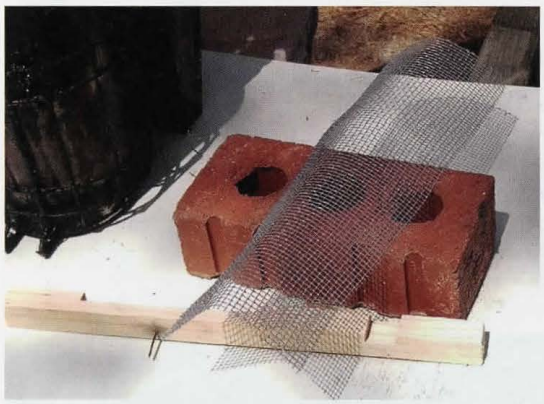


Figure 3 Front entrance moving screen: #8 hardware cloth

Figure 4 Moving screen inserted in front entrance

then be moved to the desired location in the original bee yard. It should be noted if you move hives in the same yard without moving them three miles for six weeks but say three weeks, foragers will find a home. In cold weather, when the bees are not flying for days, you can move the colony within the same yard.

If you are moving a hive from the home yard to an out-yard greater than three miles away, close the hive entrance and any holes at night or early morning prior to the bees flying. Load the hives on a trailer with a hand truck utilizing a drop-down gate. If two people are available, you may be able to load the hives by hand into the back of a pickup. I have gone from ten frame hives to eight frame hives which makes moving easier.

Depending on the size of the bed of your truck, short or long bed, you can move with large wheels can be inserted under the hive, tilted back, and the hive moved. A trailer with a ramp can then be used to roll the hand truck with the hive up onto a trailer without having to manually lift the hive. If splits are made from an existing hive, often the five frame or less split is light enough to easily lift into the back of a pickup.

Depending on the season, two different methods may be used when moving a hive, a short distance within the same bee yard. Loss of field bees is of the utmost concern. In warm weather when the bees are flying, you may move the hive about a foot towards its destination every two or three days, allowing field bees to adjust to the new location. Or you may move the hive at least three miles (or more) after closing the hive entrance, and any holes, at night or early morning before the field bees start flying. Three miles is far enough away such that the field bees will not return to the original location. After about five to six weeks, which is approximately the life span of field bees in the Summer, the hive can

Figure 5 hive ready to move in cool weather with a solid cover; note large hand truck wheels

eight to ten, 10 frame hives or more in a pickup truck (depending on if you want to stack them). If you stack them, you need to be conscience of the weight that the truck can carry. More eight frame colonies can be moved in the same short or long bed pickup.

Another equipment item for consideration is a trailer for moving hives and spare equipment. If you do not own a trailer, you may want to consider renting one initially until you are sure the out-yard is productive and moving hives is something you want to continue. Only then should you purchase a trailer for moving hives. A trailer with a ramp is recommended if you do not have hives on pallets or a fork lift for loading and unloading. In addition to the hives being strapped and duct taped, place a cargo net over the hive cargo.

- If moving a hive in the city, the following should be determined regarding the new site:
- Locate away from heavily traveled paths and walkways.
- Use a fence, hedge, or other barrier in front of the hive that causes the bees to fly above head level.
- Provide a water source closer to your hives than a neighbor's bird bath or swimming pool.
- Meet any city zoning ordinances.

Some final considerations whenever moving bee colonies are as follows: When moving colonies, especially in warm weather, you should keep the truck moving with airflow going over the hives, to keep the colonies cool. Bees overheat quickly. Also, the truck engine running and the resulting vibration

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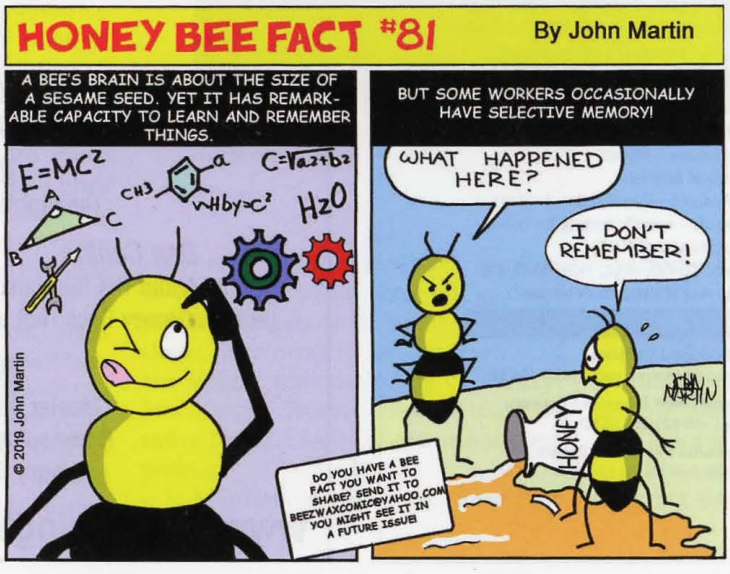
Trailer size	Approx. number 10 frame hives can transport	Approx. number 8 frame hives can transport	10 Frames approx. Weight; deep and medium	8 Frames approx. Weight; deep and medium
4'x7'	8 hives	8	1,200 lbs	960 lbs
5'x8'	12 hives	12-15	1,800 lbs	1,800 lbs
5'x9'	15 hives	15-20	2,250 lbs	2,400 lbs
6'x12'	28 hives	28-35	4,200 lbs	4,200 lbs

Assumes 10 frame deep is 90 lbs. and 10 frame mediums are 60 lbs. maximum; 8 frames deep are 72 lbs. and 8 frame mediums are 48 lbs. maximum; Number of hives can transport depends on if have handhold cleats or not, and type of outer cover-telescoping or migratory. Assumes single layer of hives.

keeps the bees quiet. Use a moving screen on top of the equipment stack with an entrance screen. Moving the hives in the early morning when it is cool should be considered. A solid top cover should be considered when moving a colony in cold weather. A trailer with a drop-down gate and a hand truck with large wheels allows one person to move a hive. Google Maps, your local agricultural agent, networking with other beekeepers, your state agricultural newsletter, and the state beekeeping entomologist may help in determining suitable locations. Go into a move after careful planning and consideration of the financial impact as well as the planned benefits. Most locations will need two to three years use before deciding if they are meeting expectations.

Figure 6 Hive ready to move in warm weather with moving screen on top and entrance screen

David MacFawn is a Master Craftsman beekeeper living in the Columbia, South Carolina area. He is author of two books, **https://outskirtspress.com/BeekeepingTipsandTechniquesfortheSoutheastUnitedStatesBeekeepingFinance** and **https://outskirtspress.com/gettingthebestfromyourbees** .



Autumn Management In The Southeast

David E. **MacFawn**

Autumn preparations are frequently deemed the most critical of any season. Beginning in September and continuing through December, Autumn is when preparations are made for colony overwintering. How well your colonies are prepared in Autumn will determine, to a great extent, how productive they are next Spring.

Let's Look at The Queen

The colony should be requeened no later than August if the colony does not have a young queen, (less than one-year old), queen going into Winter. By requeening in August, the new queen has enough time to achieve four to five frames of Winter worker bees. November and December are typically the lowest brood levels during the year, sometimes even reaching a broodless period. A young queen will also help minimize swarming next Spring and helps reduce queen failure during heavy colony build-up in the months of February and March.

Figure 1: The queen. David E. MacFawn photo

Food & Brood

Feeding and brood assessment should occur August through September. If the colony does not have enough bees in August, the colony should be fed 1:1 sugar syrup to stimulate brood development. Internal feeding should be used to prevent robbing the colony, also, use entrance reducers.

Early in September, if the colony does not have at least 50 to 60 pounds of honey (medium feed chamber + honey stored in the brood chamber), the colony must be fed. In South Carolina, the bees begin to store sugar syrup in the colony from mid-September through October. This results in a contiguous storage of honey in the colony without any gaps.

However, when it gets colder, usually after October, they will stop taking the feed. The bees will leave sugar syrup in the feeder and no longer store it in the colony.

As the Winter progresses, the bees move vertically through the equipment stack consuming honey until they reach the inner cover. Hence, if the bees use all their stored honey, they will huddle under a pail feeder placed on top of an inner cover to access sugar syrup (carbohydrates).

Also important besides honey storage is enough pollen in the brood chamber, typically two frames (frames 2 and 9 in a fully filled 10 frame brood chamber) will allow the bees to build-up from December until around the first of February. This is when the Maples bloom in South Carolina, which is usually a good early bloom.

Figure 2: feeding; often sugar syrup in the south will not freeze in the Winter. David E. MacFawn photo of Danny Cannon's equipment

Be aware, in some locations, there are pollen dearths in the Autumn, which may impact Winter bee development! If either enough honey or pollen is not available in the hive, the colony should be fed sugar syrup or pollen/substitute. It takes honey and pollen to raise young bees.

New Rule of Thumb

Weak colonies are defined as ones that do not have at least four frames of brood, sufficient honey stores, and sufficient pollen stores. The old rule of thumb, which is no longer recommended, was to combine a weak colony with a strong colony, supposedly resulting in a strong colony. The weak queen was killed and the colonies inspected to ensure they were disease free. Combining two weak colonies was not recommended.

However, this old rule of thumb has been replaced in favor of culling weak colonies in Autumn. This change in approach is based on the difficulty in detecting diseases and viral infections, as well as the costs of labor, equipment, and feed to sustain a weak colony over Winter. It makes little sense to save a weak colony if it leads to further illness or compromises other viable colonies.

Good Management Practice in Winter

During colder months new equipment should be assembled and older equipment should be repaired. New unpainted woodenware should be primed and painted with two coats of a high-quality paint. Old equipment in need of repair and painting should be swapped out of the field to a location accessible to be worked on in the November, December time frame. It is less expensive to maintain your existing equipment than to purchase, assemble, prime, and paint new equipment. New equipment that is procured and assembled may be determined by your colony growth plan and sales and marketing plan. In South Carolina's high humidity, I have found equipment assembled with a high-quality water-proof glue and nails and painted with a coat of high quality primer and at least two coats of good quality paint, will last about ten years prior to refurbishment.

Keep Planning

A colony growth plan, plus a sales and marketing plan should be developed. These plans identify existing equipment and resources and any new equipment that will be required for replacement or growth. Necessary new bee yards for the upcoming season should be secured based on your colony growth plan, and sales and marketing plan. Financial analysis numbers should be analyzed to determine if you can cover your costs with the number of colonies and their honey production in an outyard. If pollinating, you need to first analyze expenditures to determine pollination rental rates to ensure a reasonable return. Then pollination contracts and fee structures can be offered to interested parties. For more information refer to my book,

https://outskirtspress.com/BeekeepingTipandTechniquesforthesoutheastUnitedStatesBeekeepingFinance

Varroa mite levels, having been monitored throughout the Summer, should be again checked in August and also in October and November. The reader is referred to Randy Oliver's site: **www.scientificbeekeeping.com/** for more information on what are acceptable levels. In Autumn the queen will reduce her egg laying, resulting in an increased number of *Varroa* mites becoming phoretic (on the bees and feeding) or dispersal (*Varroa* on the bees and not feeding) rather than in the brood. This will result in higher mite levels but more accurate mite readings. Treating for *Varroa* mites should be considered based on the mite levels.

IPM

Mite levels can be determined using either the sugar roll or alcohol wash methods. Sticky boards are no longer considered reliable for obtaining accurate mite levels as too many factors come into play when assessing various sized colonies at different times of the year. Usually, November and December are the queen's lowest laying time and an excellent time to treat. Most treatments only kill phoretic / dispersal mites (except Mite Away Quick Strips – MAQS or Formic Pro) so November and December are an excellent time to treat with Oxalic Acid since *Varroa* mites are on the bees and not in the brood.

In South Carolina, the colony will need 4-5 frames of Winter bees to get the colony through the Winter until late March or early April. Treating as necessary in August will ensure healthy nurse bees which will help raise healthy Winter bees. Winter bees will start emerging at the end of August to first part of September. Winter bees have more fat / Vitellogenin in their bodies that enable them to overwinter better. Also, the Winter bees are confined and do not forage as much which aids in their longevity.

Last Minute Thoughts

If you need to feed in the Winter or Spring, feed continuously until the nectar flow starts. I prefer to use pail feeders inverted over the oval porter bees escape hole in the inner cover. If needed, the bees can huddle under the pail feeder. Other feeders may have an issue where the bees cannot access the syrup when they are clustered in cold weather.

In the Fall, if not done previously during the dearth period, reduce your entrances with an entrance reducer to minimize robbing and yellow jacket problems. Yellow jackets will invade weak colonies and kill them. Also, queen excluders need to come off as they can prevent the queen from moving up with the cluster.

Storing frames are also of concern. There are two factors to consider when storing frames of drawn comb. Brood frames will be affected by wax moths. To store brood frames place them in a plastic bag and freeze them for several days. The wax moths are after the dark

Figure 3: Wax worm
Image by skeeze from Pixabay

Figure 4: Small Hive Beetle Larva
Jeffrey W. Lotz, Florida Department of Agriculture and Consumer Services

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brood section of the comb. Clear white super frames are typically left alone by wax moths. Frames with foundation are rarely affected by wax moths. I stack supers with drawn comb at 90 degrees so that light and cold weather gets to the frames. Wax moth larvae are killed when it gets to freezing temperatures, especially if they are outside of the cluster. A final consideration is extra equipment. Any extra equipment should be removed from the hive due to Small Hive Beetles (SHB), especially if it is a weak colony. This is due to the bees not being able to care for the empty space where SHB can hide. As mentioned earlier, if it is a weak colony you should consider culling.

SO.....

Autumn colony management will determine your success next Spring to a great extent. In much of the southeast, the colonies should be fed to ensure at least 50-60 pounds of honey in the combined brood and feed chambers. Weak colonies should be culled and not combined. Colonies should be assessed for *Varroa* and treated if necessary. The colonies should go into Winter with a young vigorous queen. A colony growth plan, and sales and marketing plan should be developed to direct your tasks and efforts.

Special thanks to the following for reviewing this article:

Sally Adams
Larry Coble
Freddy Proni

CATCH THE BUZZ

THE KEY IS NOT WHETHER THEY ENCOUNTER A DISEASE – IT'S WHETHER THEY ARE FIT AND HEALTHY ENOUGH TO FIGHT IT OFF.

More intensive beekeeping does not raise the risk of diseases that harm or kill the insects, new research suggests.

Intensive agriculture – where animals or plants are kept crowded together in very high densities – is thought to result in higher rates of disease spreading.

But researchers from the University of Exeter and the University of California, Berkeley found this is not the case for honey bees.

Their study modeled the spread of multiple honey bee diseases and found that crowding many colonies together was "unlikely to greatly increase disease prevalence."

However, the research only applies to existing honey bee diseases – and the findings suggest intensive beekeeping could accelerate the spread of new diseases.

"Crowding of animals or crops – or people – into minimal space usually increases rates of disease spread," said Lewis Bartlett, of the University of Exeter and Emory University.

"We carried out this study because beekeepers were worried about this – especially given the many threats currently causing the decline of bees," Bartlett says.

"To our surprise, our results show it's very unlikely that crowding of honey bees meaningfully aids the spread of diseases that significantly harm honey bees."

Bartlett says honey bees live in close proximity to each other naturally, and the models show that adding more bees does little to raise disease risk.

"So, beekeepers don't need to worry about how many bees they keep together as long as there is enough food for them," he says

"The key is not whether they encounter a disease – it's whether they are fit and healthy enough to fight it off."

Although the research shows intensification of beekeeping does not boost diseases among honeybees, Bartlett points out that intensive agriculture – especially use of pesticides and destruction of habitats – harms bee species including honey bees.

The Blind Beekeeper

Stephen **Bishop**

We all like to think we are open minded and thoughtful people when it comes to our daily lives and especially our beekeeping. We want what is best for our bees as that is a great benefit to us if our bees are healthy and thriving. Good hives bring in lots of nectar and produce lots of honey which provide us with the money to continue doing what we love to do in our daily lives. Many of us sell by-products of the hive like the wax, the cosmetics we make, candles, pollen, propolis, honey, on and on it goes.

But how did we get to where we are today? Was it pure luck, or did we have the good sense to find a mentor who could help us grow with our bees and be as valuable to our bees as they are to us? Did we join a beekeeping club and attend meetings regularly where we could ask questions and get good answers to the problems we were having with our bees at different times of the year? Is it time to pull honey? What are the bees feeding on? How much smoke do we need to use to open a hive? Again, the questions are endless and they should all be asked and answered. But many times, this is where the problems begin. Many beekeepers are blind.

No, they can see all right, but somewhere in their minds they cut off their own learning experience by not allowing the light of truth to shine in.

This happens with new and longtime beekeepers alike. Example: A new beekeeper joins or visits a beekeeping club and asks a question such as, "Should I start with top bar hives?" The leaders in the club may answer, "No," and let it go at that. Now the person asking the question is bewildered because they may have little funds to buy pre-made hives or may have read somewhere how great top bar hives can be. This can be a turn off to many as they have blinded themselves to the truth. The mentor has caused this temporary blindness by not explaining why starting with a top bar may not be good for a beginner.

Starting with top bar hives may be fun and exciting, but it does take some understanding on how the hives work. Many new beekeepers have worked top bar hives and have been very successful as some folks just seem to be in the right place at the right time or just plain lucky.

Many experienced beekeepers have seen the problems that may arise for a new beekeeper pulling a top bar out of the hive and have the comb full of bees, honey, brood, and maybe the queen break off and hit the ground, killing the bees on the comb. They don't want a new beekeeper to have to learn from making the same mistakes they have made over the years. They want to shed some light on what it takes to properly handle top bar hives and it takes time to learn how to do it well. Helping a new beekeeper see the truth may help him/her.

So the smart mentor will explain why he/she teaches what he/she does and the smart beekeeper will consider the reasoning behind why the mentor says top bar hives may be fun and cheap but it does take some education to keep them well.

The blind beekeeper will get upset that someone disagrees with them and their own preconceived ideas and do many different things as a result. They may decide to go ahead and start with the top bar hive, they may quit this club and move to another one where they may hear a different opinion that they can agree with, or they might just decide not to become a beekeeper at all. Blindness can cause many problems for us all.

Most clubs and mentors want to avoid this by making sure they explain the pros and cons of each situation that comes up. But remember, it takes years to become proficient at beekeeping for most and you cannot learn everything in one meeting or class. Nor can a mentor teach you everything in one sitting at a club meeting or class. Blinding yourself and blaming others for your mistakes or lack of skill does not help you grow as a beekeeper or a person.

Open your eyes and consider the options you were given and make your decisions on facts and not opinions. You have heard many folks say that if you ask ten beekeepers a question, you will get twenty or thirty different answers. Opinions are not answers to questions. Seek out the facts and you will move a long way forward in whatever you decide to

do. That takes an open mind with blinders off so you can absorb the information that comes your way, but remember, the first few years can be overwhelming with so much to learn. We have all been in your shoes and if we are still here after many years, we must have listened and learned at our own pace along the way.

In today's world of instant everything, many will go to social media for answers. Please be aware that many wannabees also use social media to propagate what they believe whether it is true or not. Many are very well-meaning and good folks who don't know what they don't know. We see this with so many videos posted showing the new beekeepers making their first hive inspections or honey extractions that they are so proud of. If they would watch their videos in five or ten years down the line after they get some knowledge, they would be embarrassed by the mistakes they have made and the bad information they put out for others to see. Many folks who watch videos on social media may be a month or two behind those who posted the videos. How sad for the honey bees.

If you like to watch videos, then by all means please do, but keep in the back of your mind that you have no way of knowing if the person posting the video is a successful beekeeper or all their bees have died soon after the video was made.

And this rule goes for reading beekeeping materials as well. Everyone should read as widely as possible and gain as much knowledge as they possibly can. However, if you read things that are wrong, you will end up doing the wrong things you read about online. Even the esteemed colleges will have papers published that may not be exactly what is realistic in the real world. Sitting in a lab does not make a person an expert on beekeeping. Writing papers on subjects you have read about from some other author's papers or books does not make you an expert. When reading such reports, take notice of how many times the writers use words like, this may be the result, or it could be, or we think, or more research is needed, or we may find, or we shall see in the future. Yes, we need research, but opinions should be left out until the facts are proven. But even then, who is funding the research? Is the end results biased to keep the funds coming in? We hope not.

Working with honey bees does not make you an expert either if your bees die every year or you keep buying replacements so you can say you are a beekeeper.

Blindness can lead you into walls that you may not know are there. Putting down a mentor who is trying to help you is blind thinking and will cause you much regret in the end. Instead of pointing fingers and complaining, try to listen and ask more questions to help you understand what is being said. You can help the mentor if you are willing to speak up, to become a better mentor for you.

Are all mentors perfect and know it all? Of course not. No one knows or understands everything there is to know about beekeeping or any other subject. Some think they do and may charge large sums of money to speak to your local club or group. Many like to use the letters in front of or behind their names to make them appear to be knowledgeable on any subject, but that is not always the case.

Just because someone tells you they have Dr. in front of their name, does not mean they are qualified to operate on you medically. The Dr. may be a designation from some unrelated field that you are trying to become proficient in such as beekeeping. Many long time beekeepers should have a "DR" behind their names meaning they "Do Right" by the bees and those they are mentoring because they have put in the years to master beekeeping and are continually striving to do better. Many have made the same mistakes you are about to make and would like to help you see you are blind and cannot see how you can harm your bees by not gaining more knowledge and insight on how bees work in nature. We are all still learning and hopefully getting better at our craft.

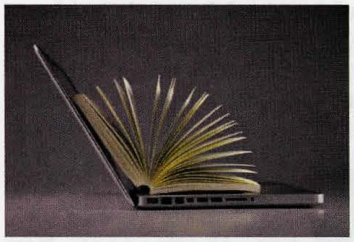
Don't be impressed with titles and degrees that mean nothing to a bee. And remember, most received their degrees years ago before beekeeping became more difficult with all the new pests and diseases coming along each year or season.

Have you ever noticed how hard it is to get a long time beekeeper or commercial beekeeper to attend your local club meetings? Many do not want to bother on a regular basis with the questions and lack of understanding new beekeepers have. Good ones know how important it is to help new beekeepers in order to replace retiring and dying old time beekeepers to keep the craft alive.

Some will speak if they can make money by doing so. Some may take advantage and sell new beekeepers things that are not necessary to be a successful beekeeper. Some like to hawk their latest book or paper. I have seen new beekeepers buy used boxes that should have been burned because the new beekeeper was blind to the problems that can come with used equipment.

I suggest you learn as much as possible about anything you get involved in, but don't be blinded by your own ignorance and biases. Open your eyes and you may be surprised at what you have been missing. It is a beautiful world with the bees all around us. Wouldn't it be sad if they were to disappear?

And a closing thought. The next time you hear a speaker or read in a book or magazine that Einstein said mankind would die out after four years if bees became extinct, stand up and explain that Einstein never said that and that it is not a true statement at all. Of course our diets would become very bland having mostly wind pollinated foods, but we can stop that scenario if we all become better beekeepers. We can do that by keeping our opinions to ourselves and seek facts that the bees have proven to work over the years. Remember, bees don't read books.



Literacy

Ellie **Andrews**

Honey bees are the best teacher. Or so they say. Unfortunately, mine don't speak English, and I can be a little dimwitted, so I have to figure out most things some other way. I'm not the only one, though: at the Greater New York Bee Conference in March, speaker Phil Craft mentioned Google Scholar as a useful source of high-quality information, and I saw lots of people in the audience taking notes. That's when I began to think more about how we as beekeepers find, evaluate, and use information. I'm finishing up my PhD at Cornell University, where I think a lot about similar questions: how to make the most of library resources, judge the credibility of particular references, read scientific literature, and share information responsibly. This is the core of "information literacy," which is as much a part of my beekeeping toolkit as my smoker or hive tool.

A librarian once told me that the smartest way to start researching a topic is by talking to someone knowledgeable. Like many of us, I rely on the people in my club: Peter Borst, who's forgotten more about beekeeping than I'll ever learn; David Hopkins, who volunteers at Cornell's Dyce Lab for Honey Bee Studies and always has something thoughtful to say; Shelley Stuart, who models how to squeeze bees into a full life; and other generous officers and members, too many to name here. But, as the saying goes, ten beekeepers might have eleven opinions — and, more to the point, some of those opinions might be wrong. How do I assess a given beekeeper's authority and credibility? Their years of experience? That's a reasonable starting place, but limited, if they've just done the same thing year after year. Their success in keeping their colonies healthy and productive? That's super important – but it can feel like prying to ask. Education level? Formal education doesn't necessarily seem relevant, although beekeepers with more formal education may be able to draw on a wider range of resources. Informal measures, like Master Beekeeping certifications show that someone has made an ongoing effort to learn more, which is probably important regardless of what program it is (the Eastern Apicultural Society, Cornell, other universities). In sum, I'm not usually comfortable making a call on how credible a fellow beekeeper is, so I usually end up back in the books.

When I have a particular question, I might look at a textbook, like Dewey Caron and Larry Connor's *Honey Bee Biology and Beekeeping*. And someday I'll Spring for the latest edition of *The Hive and the Honey Bee*. But I often head over to (regular) Google, too – with some trepidation. I have to think carefully about how to phrase my query, and try a few different combinations. This illustrates the idea of "Searching as Strategic Exploration" (from a document by the Association of College and Research Libraries (ACRL) on information literacy): "searching for information is often nonlinear and iterative, requiring the evaluation of a range of information sources and the mental flexibility to pursue alternate avenues as new understanding develops." In other words, searching itself is a skill, and searches need

Google Scholar < Google Scholar

to be repeated and refined multiple times. As an example, I've heard that I can encourage my bees to collect more propolis and therefore boost overall hive health/immunity, if I staple screens to the inside of the hive. But I don't really know how best to do it. So I Google propolis staple screen. But that gets me results about travel screens and propolis traps – not very useful. So I try propolis staple screen inside of hive, to find more targeted information. Most of the results are still not very useful, but I see a hit about propolis envelopes that rings a bell, so I try "propolis envelope" screen (the quotation marks mean that the two words are searched for as one phrase) and now I've got a mix of reasonably useful stuff from a range of sources: *Nature* (scientific journal), Bee Informed Partnership (high-quality national research team), *ResearchGate* (repository of scholarly articles), *Beesource* (unmoderated forum), *Honeybee Suite* (blog and wide-ranging website), *Reddit* (self-moderated forum), *Basic Beekeeping* (blog), and more.

The next step is evaluating these sources. Which of these is most reputable? Anything I run across that doesn't come from a clearly credible, high-quality source, I take with a grain (or generous scoop) of salt. Happily, the language of the "propolis envelope" pulled up more scholarly stuff than usual (namely the first three sources in the list above); for other searches, my results pages are mostly made up of *Beesource* threads, *YouTube* videos, and

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blogs. If there's an extension website, I'll start there – being sure to ask myself which information on, say, the North Carolina extension website is still relevant in upstate New York, and which isn't. More broadly, I stick to who has authority in a given area. If I want to know about queens, I look for work by Dave Tarpy. If I want to know about propolis, I look for work by Marla Spivak. If I want to know about breeding and genetics, I look for work by Sue Cobey. I mostly skip blogs, ever since I ran across a photo of a new beekeeper proudly displaying a frame of brood – with evident signs of foulbrood. But if most of the search results are blogs, I might open up a couple and skim through them – never just one, since I'm looking for common threads. That way I can pull out some general principles, rather than specific procedures. Occasionally, I look at scholarly, peer-reviewed journal articles, although they're less helpful for beekeeping how-to's and more useful for understanding issues in biology and toxicology, like the effects of certain pesticides or the genetic dimensions of health and immunity. To continue the example of the propolis envelope, I see in my search results a scientific article describing a study testing the efficacy of the propolis envelop against American foulbrood. Entomological or biological articles are as difficult for me to read, as they are for anyone without much training in the STEM fields (science, technology, engineering, and math). But I can tell from the article that there were measurable benefits from those traps, and I don't really need to know much beyond that. In general, I look for scientific articles intended for a broader audience and therefore written more accessibly, such as those in *Nature* or *PLOS* One or other top-tier general scientific journals (even *Scientific American*). Literal access is important, too: because of my affiliation with Cornell, I can download articles from behind a paywall for free. But most people can't.

If you find the abstract of a paywalled article that you want to read, check with a reference librarian at your public library. Anyway, in this study, I can see from their methods that they stapled commercial traps to the inside of their hives, which should be easy enough for me to do (although I'm kind of a cheapskate, so the next search is on whether I can rig something up myself). Note that scientific studies are generally only able to make claims about one specific thing, in this case, AFB. Scientists can't run a rigorous experiment unless they narrow the scope of their research to just one or two specific variables and control for everything else. It can feel limited, but that's just how good science works.

In looking for answers to some of my questions, I might end up in a popular science article, such as something from *National Geographic*, but the tradeoff for readability is that these articles can be alarmist or misleading. I often find myself shaking my head in disagreement: some of the regular contributors to *Mother Jones*, for example, sensationalize the risks of pesticides, while on the other "side," contributors to the *Genetic Literacy Project* and the *American Council on Science and Health* website tell only partial truths as well. There is a lot at stake around issues like these, which makes it even harder to know who to trust. But I don't always like to talk about "sides": honey bee health is subject to many factors and it makes sense to prioritize different factors in different conversations. Again, my rule is to skim a few articles about the same topic, to find commonalities. I also trace any news articles about recently published scientific studies back to their original source, where, even if I can't figure out the particulars, I can tell whether the article has been described accurately or hyped up.

Finally, I mostly use a more passive approach to build my

knowledge of beekeeping and keep up with news and research. That helps me know where to look later on, if I want to learn more about a particular topic. In my inbox, there's *Bee Culture's "Catch the Buzz"* updates, *ABJ-Extra* updates, messages on my club's list-serv, and occasional emails from Randy Oliver's *Scientific Beekeeping* list-serv. On *Facebook*, I'm in a few local/New York bee club groups, and I follow the *Cornell Dyce Lab* and the *Bee Girl* (Sarah Red-Laird). One of the most valuable tools in this regard has been the daily digest of *BEE-L*, a list-serv that connects hundreds of experienced and thoughtful beekeepers, mostly in the U.S. This is a prime example of the ACRL's idea of "Scholarship as Conversation," where "communities of scholars, researchers, or professionals engage in sustained discourse with new insights and discoveries occurring over time as a result of varied perspectives and interpretations." Many contributors to *BEE-L* are unwilling to accept assumptions and conventional wisdom, instead delving into the nitty-gritties of how we know what we (think we) know about bees and beekeeping, all the hows and whys. There are rarely definitive answers, but instead a suite of well-reasoned queries, observations, conjectures, and more.

There are some things I still don't understand well, because the available information is muddied by exaggerated claims or complicated science or conjectures that are difficult to prove. These include apitherapy (my current understanding: effective only for a very narrow range of ailments), honey as a inoculant against local allergies (my current understanding: unlikely), and the local adaptation of honey bee populations (my current understanding: possible over long time frames, but unlikely in most places in the U.S. today, given the movement of hives around the country). Notice I say "current" understanding: I expect my thinking to evolve over time as I learn more – since the truest thing ever said about beekeeping comes from the well-known authority on honey, Winnie-the-Pooh: "you never can tell with bees." (I am grateful to Jim Fischer for pointing me to this nugget.) There will always be debates and gray areas; that's what makes learning about bees a lifelong endeavor.

In the end, I almost always have more questions. But that's okay: the ACRL describes "Research as Inquiry": "research is iterative and depends upon asking increasingly complex or new questions whose answers in turn develop additional questions or lines of inquiry in any field." In other words, it's about the process: having conversations, being open to new information, examining our assumptions, finding a balance between respecting expertise but being skeptical, staying humble, and learning to ask more and better questions along the way.

Ellie Andrews is a doctoral student in Development Sociology at Cornell University, studying the sociology of honey bee health. To get in touch: **eleanor.snow@gmail.com**.

THE STORY OF A. I. ROOT

Al **Root**

So much of my experimenting, or perhaps to call things by their right name, tinkering with bees in cold weather resulted in nothing but loss that perhaps I might be excused for strongly insisting that the colonies be carefully attended to when it is warm and then let alone during cold spells. Strong colonies take care of themselves in almost all emergencies. I tried hot-beds, glass houses, stoves and a host of appliances to enable me to nurse up weak colonies in the Spring—colonies that should have been united in the Fall, five into one instead of being scattered in five hives. I wondered if we would ever recover from that folly of follies of calling a quart of bees a colony of bees fit to Winter. I am conscious that it hung about my own apiary until I began to feel it the disease of all diseases that was difficult to eradicate.

How Much Cold Will Bees Stand?

During cold weather, when the temperature does not go lower than somewhere between 30° and 40°, single bees will live from 24 to 48 hours in a dormant state, to all appearance dead. If they are not warmed up and fed at the expiration of this time, or if they should remain out in freezing weather they then pass all human power of resuscitation. When bees are massed together in a cluster they keep up an animal heat that keeps the whole cluster above freezing. This is apparently kept up some hours even after the bees have exhausted all their food and when they are, to all appearances, dead. They will even stand a temperature of zero in this condition, and many of them revive; but if they are left too long, say three or four days, they can not be revived. I made many experiments to test this matter and reported them in the January number of Gleanings for 1876.

Controlled Mating of Queens

Although greatly interested in the progress of the experiments in artificial fertilization of queens, I could see that the experimenters were making little or no progress. I enjoyed my 4th of July in 1871 by making a cheese-cloth box seven feet high and six feet in diameter. I put in a lot of drones and two queens seven or eight days old. As the queens circled around and the drones circled after them I had strong hopes and kept them there for several days, but alas, they circled in vain.

A friend made a house of cloth twelve feet long but with no better success. We both feared going to the expense of wire-cloth but determined to do so should further success be reported. Why couldn't we have succeeded just once to get a little faith? It is true, as we have many times said, that so far as the production of honey is concerned, the accepted way of letting the queens meet the drones in the air was good enough, provided we had an undoubtedly pure queen to rear cells from. But as every beekeeper wants at least one queen of absolute purity, who was to supply them?

Early Experiments with Baby Nuclei

In 1873 I saw some hives of Italian bees containing but one frame each and that frame was only 2¼ by 3 inches in dimensions; yet notwithstanding this small size, each had a queen and the bees gathered pollen with as much bustle and importance as some greater colony. As one of these queens would fill their comb with eggs in fifteen or twenty minutes, the combs could be watched closely to find when the queens became fertile. My friend who showed me these hives said they were some of his father's experiments. I felt that if these wee hives could only be managed so that the bees would not swarm out, they would be fine for rearing queens.

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Moving Bees Short Distances

Bees are reported to go back to their original location even after having been removed as far as two miles. I know of no way of moving a colony of working bees during the working season a hundred yards without loss. I made careful experiments in the matter. I smoked, drummed and clustered them with their queen apart from their combs, yet go home they would, a great part of them, in spite of all I could do. To be sure, thoughtless people claim there is no loss, but if they put a similar hive on the original spot they can easily determine how many are lost. If no such hive is used, the bees scatter about in a way that is likely to be unnoticed. Careful inspection of the shrubbery at nigh or early in the morning generally reveals the homeless wanderers. Moving the hive a foot a day is the safest plan I know, but it is a great bother and after all a considerable damage to the work of the bees.

Of course, by confining the bees to the hive or by waiting a week or more until after a spell of bad weather, I could move them without much loss; but careful observation showed that even then the older bees, many of them, were missing. I once purchased a colony of bees from a neighbor in January. There was no weather when they could fly until March, but even then so many bees went back that the rest froze outright the first cold night. An examination showed a great part of them scattered about on the ground around their former location.

Why Bees Shake Their Bodies

In regard to why the bees run rapidly over the combs, frequently turning around and shaking their bodies violently, it is my opinion that this is only an expression of rejoicing caused by a sudden yield of honey, an accession to their stores by robbing, by feeding, by fine weather after a storm, by a lot of young bees just emerged, etc. I have seen a whole colony wildly rejoicing just because I gave a few clean empty combs when they had the rest all full. I had no faith that the wax producers have anything to do with it, although I had seen such statements. When a young bee makes its first foraging trip and returns with a load of pollen it seems anxious that all shall notice its great achievement, goes in the hive and out several times, shakes it body, runs against it fellows as though they were of no account, and often seems to induce it fellow juveniles to go forth in hot haste to see if they can not do as well. Bees are as jolly, playful and happy as kittens when once they are known.

Experiments in Swarming

Natural swarming for the first time rather got the better of me in 1870. Removing all queen-cells and all honey, and giving empty combs in the center of the hive, did no good. One colony even swarmed while I had the hive open removing the honey. I thought I would try natural swarming a little, since it had been claimed that such swarms work so much better. However, after some experience of this kind I resolved that if I didn't take the matter in hand and have swarming when I wished it and how I wished it, it would be because I couldn't.

Here is my complaint: My first natural (born fool, I should like to say) swarm, I put in a "diamond" hive. It stayed half a day without working a speck and then came out again. As I had no combs of brood the size of that hive I thought I would try hiving them again. But, as soon as the queen was uncaged they were off again. Of course I always kept my queen's wings clipped, but this time the swarm went off and joined itself with a small swarm of black bees belonging to a neighbor. I hived all the bees, but when explaining the matter to my neighbor he said his bees were yellow, too! So away went half a bushel of my best Italians.

Another swarm acted the same way and I paid $5.00 for a small third swarm of black bees so that I might carry my own Italians home. Still another swarm came out four times and I could keep them only by caging the queen nearly a week.

The Shaken Swarm Plan in 1870

After all this I became disgusted with the state of things and decided to carry out a plan of my own. I shook off all the bees, including the queen, into an empty Langstroth hive on the old stand, and gave the bees one comb of brood, as in case of all the natural swarms. The shaken bees went to work and built more comb in tow days than my natural swarms did in a week. The parent hive had a new location, of course and young bees enough to care for the brood. All were shaded from the hot sun.

In any kind of swarming I always furnished queen-cells or brood from

choice stock, selected with a view to give gentle bees and good honey gathers.

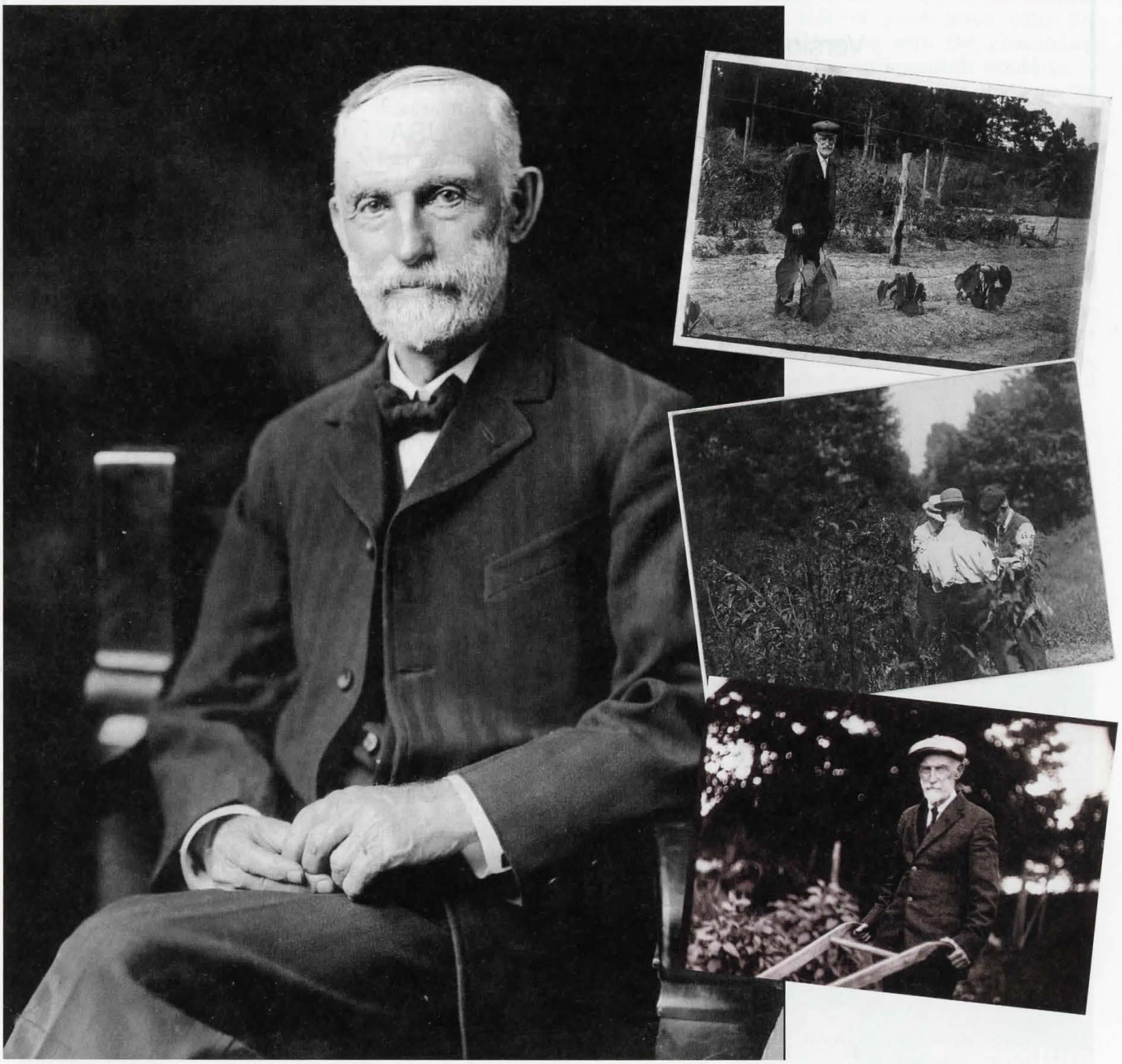
The Need of Warm Supers

In the house apiary in 1876 I had, for the benefit of visitors, a full set of fancy glass boxes, with the bees working on the white foundation. To avoid disturbing the bees with too much light when no one was watching them, I threw over the boxes a cloth curtain. On one of the hives I used by accident a thick woolen cloth, and several times when this was carelessly omitted the bees seemed to cease work in the boxes. Further experiments showed this to be the case, for even if the house were as dark as pitch when the spread was left off, the bees would very soon almost desert the outside boxes. This shows that it is very important for comb-honey supers to be well protected from the changes of the weather. This experiment was made during quite warm weather, and the hive was inside the house apiary.

A Self-Hiving Apparatus

A beekeeper in Pennsylvania sent me in 1877 an apparatus for hiving a swarm. The plan was to have a colony on a plat form so nicely balanced that, when a swarm left, the hive changed its position enough to close the entrance. The bees were supposed to have been taught previously to go out and in through an empty hive and when they returned as soon as they missed the queen they returned to that empty hive.

I suppose this machine would have worked, and yet even if it did it would not have paid to use it. It would not be practical to make a machine for colony, for they would cost several dollars each and the inconvenience of having hives all encumbered in this way would be out of the question. Why will beekeepers waste their money in patenting things so impractical?



that have to be dealt with. Small hive beetles among them. For these, use traps. Use five or 10 of those "V" shaped traps on top of every super in the hive. Make it so that when the bees are chasing the beetles, the only place to go is into a trap. If these pests are common all Summer, use traps all Summer, but especially now. Remove as many beetles as you can as fast as you can. And keep traps on all Winter.

The foulbroods of course can be a disaster. If you haven't been watching, have weak colonies, spotty brood, sunken capping in the brood area...get help fast. Confirm with an experienced beekeeper, or send in to the USDA Beltsville Bee Lab (Google that), but it takes a bit and you are rapidly running out of time. If an infestation is confirmed, you might be better off destroying the equipment and the bees, save all the honey but burn all the rest. A tragic ending, but in the long run a better choice this time of year.

The biggie of course is *Varroa* mites. And there are multiple choices here. Starting with full scale war. Elsewhere in this issue is an IPM bulletin dealing with all the ways to deal with *Varroa* using poison. Some of these are toxic, will be absorbed in the wax and leave a residue. Some are non-residue compounds – the acids – but require protective equipment for the applicator. These all work to control *Varroa*, and by October, following label instructions, your colony will be almost completely *Varroa* free. Starting today, of course. The key, however, it to continue to monitor before, during and after treatments to ensure that re-infestation has not occurred. This happens, and the result of all your hard work, if you don't notice this, is a dead colony

next Spring. Test, test, test.

There are non-chemical IPM methods mentioned here also. These are effective to varying degrees but require some amount of time over the course of the Summer. But don't write them off completely right now. Especially the queen technique.

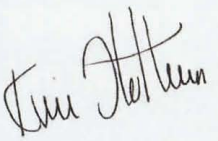
There are lots of ways to do this, that is, interrupt the brood cycle so *Varroa* have no place to reproduce and thus begin to see population reductions. A very successful technique is to do a split with your colony, feeding both if necessary allowing for less weight for equipment, and letting both remain queenless for at least 20 days. If possible, use an organic acid dribble method towards the end of this period to expose all the mites to the chemical, removing them from the scene. Requeen when ready, and get the best genetics you can for mite resistance. Re-queening now will provide each of these splits with a new productive queen going into Winter so there are lots of bees ready. No matter how much you have, feed, feed, feed, feed both sugar and protein mix so there is absolutely no shortage next Spring because this queen will hit the road running producing lots of brood.

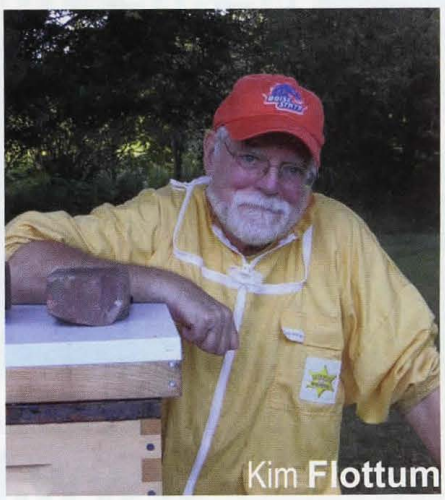
But wait, there's more. If you live in an area that's essentially free of Winter, your choices are different. You probably don't have a broodless period naturally, so what you can do is find and cage the queen, or make splits and leave each split queenless for as long as it takes to raise a queen, then requeen with the genetics you want. You have to have a broodless period however, so you may want to cage the queen for a week or more, then split, wait and requeen.

If not using a poison in your approach there are some techniques that work, and even if not doing anything at all there are ways to reduce mite issues.

There is one approach that is questionable however. No Treatment, no matter what. The philosophy here is that if the bees aren't tough enough to survive *Varroa*, then they should be part of the population. I can not argue with that on some levels because making *Varroa* resistant selections is to be encouraged. It's the just letting them die that causes problems. And that problem is that bees in that hive often, if not always, abscond late in the Fall, taking many of the mites with them to other hives.... maybe your hives, maybe those of your neighbors. Obviously, you don't want to continue a genetic line that succumbs to mites, but at the same time, you don't want to contaminate the rest of your hives with the mites leaving with the absconding bees. So...an approach would be to remove the queen that produces the bees that don't resist mites, treat the colony with a low level organic acid to reduce the mite population, leave for a time as queenless to get rid of brood mites, then requeen with a line that is resistant to the mites.

So you can continue to make selections, increasing the resistance of your bees, and not populating the entire neighborhood with the mites from crashing colonies. That, to me, sounds like a win:win for you and the bees.





Pollen

Bill **Hesbach**

Pollen, the miraculous germ cell of plants and the primary protein nutrient for bees, is the fertility key to every flowering plant and tree in the ecosphere. Honored by Native American Navahos as a path to the source of spiritual life and perplexing to the likes of Darwin, who referred to the origin of flowering plants as the "abominable mystery" pollen, in some form, has been around for about 247 million years.[1]

While pollen's primary function is to fertilize plants and supply nutrition for its insect partners, pollen may also play a role in determining the development of queens in a colony. Recent work examined how the genome of honey bees may be regulated by the genome of the pollen they collect in what's known as cross-kingdom genome interactions.[2] The fascinating part of this research is the possibility that plant genes and insect genes are linked in a way that allows them to co-evolve as cooperative species. There is a lot to learn about pollen so let's start at the beginning with some of its fascinating characterizes.

At the origin, it was likely some form of beetle that lumbered up the stalk of an ancient angiosperm (flowering plant) to gather pollen and fertilize the plant. That arrangement is theorized to have lasted for about 100 million years until flying pollinators like bees came on the scene. Since then bees and flowering plants have joined in a fertility covenant that is little changed and still exists to this day.

For plants, pollen is the rough equivalent of the male sperm in animals,[3] but unlike animal sperm, which are protected inside an organism until fertilization is complete, pollen must survive encounters with a potentially destructive environment on its journey from to plant to plant. Pollen's almost impenetrable protective layers make it well equipped to survive nearly every circumstance but, as you will see, those same layers present an obstacle for bees seeking the rewards of using it as a protein-rich food.

The mystery and beauty of how a pollen grain can yield freely to a plant and at other times stay intact and unyielding is a story of unprecedented natural adaptation and wonder. What follows unfolds a small part of the alluring story of how plants and bees cooperate so that pollen can serve its dual role as a fertility agent and a food source.

The Pollen Grain

In addition to having specialized surface coatings and microscopic openings, a pollen grain has armored layers biologically equivalent to a medieval castle wall. Layers of defense defy digestion and decay to the extent that angiosperm-like pollen grains have survived from the Middle Triassic period (Figure 1).

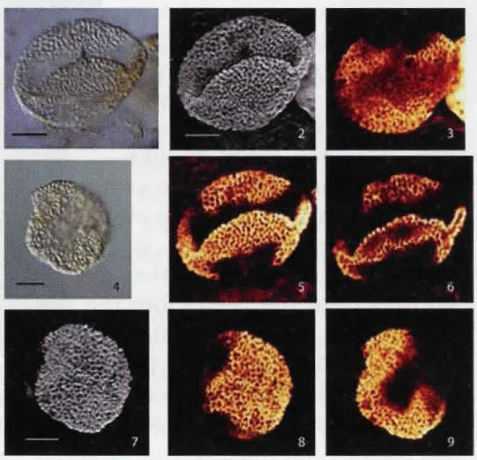


Figure 1

One distinctive characteristic comes from a pollen's unique surface coating referred to as the pollenkitt. The pollenkitt is made of lipids (fats) and other chemicals that waterproof, provide scent, and add color to the grain,[4] The pollenkitt is not a defensive layer but rather an attractant and the lipids give the grains a semi-adhesive quality which helps hold the pollen on the plant's anthers until dispersal. Also, when combed by a bee using its legs to wipe its body clean, the sticky pollenkitt helps adhere the grains as they are moved from leg to leg and finally pressed into the bright colored pellets we see arriving at the entrance.

The first actual layer of defense is called the exine (ek-seen) (Figure 2). You can think of the exine as a

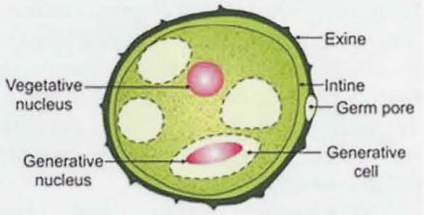


Figure 2

resilient plastic or polymer similar to those used for everyday products like water bottles or plastic bee frames. Organic polymers are almost indestructible[5] and can resist enzymatic digestion by animals and humans to the extent that eating bee pollen as a human nutrient is not very useful despite all the hype to the contrary.[6]

The exine is also what gives pollen species their distinctive shape (Figure 3). The unique shape of pollen grains forms the basis of a field of science called palynology, which is the identification of plant species by pollen shape. There's also a branch of palynology called melissopalynology that uses the pollen grains found in honey to identify the origin of that honey's plant nectars.[7]

Figure 3

The exine being a polymer is somewhat elastic and expands with different moisture levels both outside and inside the grain, which plays an important role when the grain germinates. The exine wall also has microscopic openings called apertures or germ pores that allow delivery of its interior proteins during germination of the grain and fertilization of the plant[8] (Figure 2).

When a pollen grain fertilizes a plant, it does so by attaching to the stigma, which is the female part of the plant. At that point, the reaction between the pollen grain and the stigma gets very interesting. The stigma hydrates the pollen grain, and the grain responds by beginning to germinate. During germination, the germ pores on the exine begin to exude enzymes. If the enzymes match those needed by the stigma, in other words, if the pollen is the correct species for the plant, fertilization begins.

Fertilization begins with the process of growing a pollen tube down through the style of the plant and into the ovaries.[9] When the tube is fully developed the sperm part of the pollen grain follows the tube to fertilize the egg [10] (Figure 4).

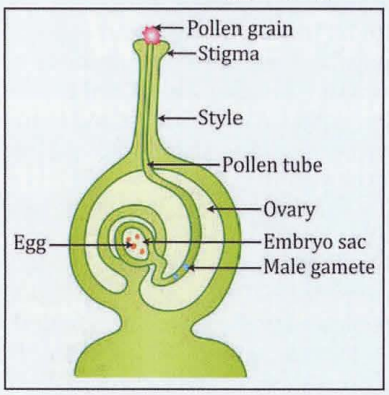


Figure 4

The whole process is governed by a complex and wondrous exchange of protein between the pollen and the plant. The result can be anything from an edible mouthwatering fruit or a simple maple copter seed. That's the basics of the plant side, now what do the bees get?

How Bees Collect Pollen

In any functional natural system where cross-species are engaged in mutual survival, it's balanced rewards that make it all sustainable. In the bee and plant world, we have known for centuries that pollen is a reward given back to bees. As an aside, this invariably leads to the perplexing thought of how did the exchange actually begin. No one really knows for sure, and there are scant few hints from the fossil record, so for now, the age-old question of which came first the pollen or the pollinator remains an unsolved mystery.[11]

Either way, the first task is to collect pollen from a plant's anthers, and bees have a few tricks to get that done. One is an interesting electrical phenomenon using static electricity. As a honey bee flies through the air, it picks up a positive static change much the same as an article of clothing sometimes does when it comes out of the drier. Static charge makes materials electrically attach, and a bee's static charge acts the same way with pollen. To understand how a static charge works, it's helpful to know that everything on a plant that's touching earth has a negative charge including the pollen grains. When a positively charged bee nears the negatively changed pollen, the grains have a strong magnetic-like attraction much the same as animal hair does to clothing. The attraction is strong enough that, at times, pollen will leap from the plant's anthers onto the bee before the bee even lands. Of course, after the bee lands on the plant, the process of pollen transfer continues as the bee physically contacts the anthers of the plant.

Once on the bee, the sticky pollenkitt is also at work keeping pollen in place.[12] A single honey bee has millions of hairs that cover every part of its body even the eyes (Figure 5). So the initial pollen load

Figure 5

is spread over the entire body. But having those grains all over its body would make flight and navigation difficult, so the second task is to collect all those grains and put them safely in their pollen baskets. Like everything else about bees, using their legs to collect the pollen grains off all the hairs on their body and moving them between their legs on the journey to the pollen baskets has some not so obvious and fascinating peculiarities.

First, is that each set of legs use a special brush on their tibia designated to comb the hairs on a particular segment of the bee's body (Figure 6). The front legs brush pollen from the head and eyes, the middle legs clean parts of the thorax, and the hind legs clean the abdominal area.

Figure 6

It's interesting to note that not all body hairs on a bee are the same. They have special adaptations to serve the area of the body where they are located. Their length, diameter, and spacing vary, allowing for precise suspension of pollen grains above the particular contours of the bee's body. Even with the all that specialization, the collection process is not immediate or completely thorough. For example, it can take a bee twenty strokes before its eyes are cleaned, and even then some grains remain in place.[12]

Once a leg's brush has collected

pollen, the process of moving the pollen from leg to leg ending on the back leg's baskets begins. Bees know when to do this because each leg has specialized hairs that act like mechanical sensors signaling the need for pollen movement. Those same hairs also signal that movement has occurred. Bees also use sensor hairs, on their rear legs, to tell when their pollen baskets are full signaling that it's time to return to the colony.[13]

Movement of pollen from leg to leg is another one of those not so obvious behaviors because even as you watch, it's not apparent what's happening. Bees don't move pollen straight back from legs on one side of their body to the basket on that same side. The pollen grains end up crossing the bee's body from the left to right and vice versa. The exchange happens at the middle legs, and I've watched bees in the process a number of times, and have even filmed it, (**https://youtu.be/PrCTUolSRPM**) but I still can't say I've seen it happening because it's done amazingly fast. After all the pollen grains are moved, the process ends on the rear leg where the pollen is pressed into a pellet using specially adapted hairs on the rear leg appropriately named the pollen press (Figure 7). The pellet is formed around a single course hair, called the pollen pin, which holds it securely during the flight back home.

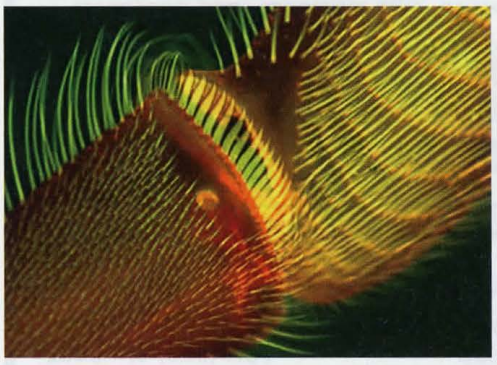


Figure 7

How Bees Digest Pollen

Once back at the colony, pollen is either consumed by nurse bees for the immediate production of brood food or placed in cells for later use. The storing of pollen in cells begins a fermentation process fostered by the growth of bacteria and yeasts that naturally occur on the grains. The fermentation provides the grains with a more suitable biochemical environment for long-term storage that we refer to as beebread. Although beebread involves fermentation, the individual grains remain unchanged. So whether a bee eats fresh pollen, which they prefer, or beebread, they're up against the same task of extracting the protein from grains.

It would be simple if a bee's mandibles were strong enough to break a grain open, but they're not. Instead, pollen consumed by bees is, in theory, subject to a form of pre-digestion that mimics natural pollen germination. When bees consume pollen, the grains end up in their honey crop where they are mixed with a sugar and acid solution. In that solution, most pollen species will start pseudo-germination and grow instant pollen tubes mimicking the process of natural tube growth that occurs down a plant's style.[14] The pollen grains are then passed to the midgut where the nutrients gradually empty from the grain.[15] Studies of pollen digestion in other bee species have included another process that involves pressure when the grains pass from the honey crop to the midgut. The theory suggests that the grains may burst due to a change in pressure (osmotic pressure) as they move into the midgut. The argument has some support, but there's still skepticism from the lack of observable evidence in honey bees.

The last part of the process is how pollen passes through the midgut during digestion. Pollen grains don't just travel freely from the honey crop to the midgut, but rather the grains are packed together and encapsulated in a porous membrane just as they leave the honey crop. The membrane package, or bolus, then travels through the midgut while digestive enzymes, and possibly osmotic pressure works to extract the protein. The time it takes for the bolus package to move through the midgut and into the hindgut as waste depends on the pollen type. If you were to look at pollen grains in the hindgut, you would discover that not all are digested. Approximately 30% of consumed pollen goes undigested, and that number can vary by species. Some species, like dandelion, resist digestion while others like clover, that has a thin-walled exine, are more digestible.[16] In the hindgut, digested grains look like a collapsed balloon while those undigested look as good as new.

Protein Contents and Collection

Bees need ten amino acids for both normal larval growth and continued health as adults. It's important to note that very few pollen species provide all 10, so it's critical that bees forage on a variety of sources (Figure 8). Other factors that determine the protein content are soil types, regional climate, and the season. Spring pollens tend to be more nutritious, which works favorably with the Spring build.[17] Influenced by soil type and the environment, some pollen will yield protein in the 9% range while others can be as high as 37%. Which leads to the question why don't bees just forage on the most nutritious source? The answer comes from studies that have shown, while proficient at distinguishing among nectar sources based on sugar content, bees don't make a distinction based on the

Figure 8

⇨

protein content. At times, bees will collect lots of things that aren't even pollen like birdseed, sawdust, and even fungus.[18]

Although bees don't make a distinction based on protein content, they are attracted to an abundant source. As a result, you will sometimes observe a single pollen species on almost every returning bee. The allure for abundance was documented in one pollen study conducted on a large field of highbush blueberries receiving pollination services. The results showed that bees were drawn away from the blueberries by two competing sources of pollen. The data from trapped pollen showed that only 4% of the returning pollen was blueberry pollen. The bulk of the remainder was split between wild dogwood and cherry pollen.[19]

One of the calming pleasures, bordering on meditation, is to take some time and watch as bees return with full baskets of pollen then land and walk into the entrance. If you miss the returning bee in flight, you can sometimes see the light colored pellets flash like taillights as bees enter the hive's darkness. It's fun to watch, but it's more important to figure out the pollen species coming in during the season.

I encourage beekeepers to first survey their area for available pollen sources by plant species. It's as simple as walking around and observing. Once some are identified, I suggest starting a log or preferably a calendar based on bloom times and color. The most accurate way to identify the color of a pollen species, in its pellet form, is to observe bees on the plant when actively collecting. On the plant, the bees' pollen baskets will provide the actual pellet color because after bees add nectar and compress the pellet, the color looks different than what you see on a plant's anthers.

An excellent time to start identifying pollen is with the first pollen of the season because there's not that much blooming at that time to confuse species. When I see yellow or light grey pollen in late February, it's likely skunk cabbage and silver maple because, in my area, they are the only two blooming. I then look at some specimens that I use each year to verify my observations. Bloom calendars are important because they document the return of a dependable cycle, and they can help predict brood rearing and honey flows.

What's in Your Pollen?

After your list is started, you can then ask the question of whether your area's floral sources provide adequate protein. As mentioned, bees need pollen that contains 10 essential amino acids for good health.[20] Since bees cannot synthesize essential amino acids metabolically, they must be derived from the digestion of raw pollen. Most pollen will have at least nine of the ten needed. If there is any scarcity at all, it will probably be with the single amino acid tryptophan, which frequently comes up missing in pollen. The one dependable source of tryptophan is the clover family (Trifolium), which in my area is known as White Dutch Clover. There are also many other species in the family including peas and beans, so odds are your bees collect tryptophan in most years.

It can be a little challenging to figure out the amino acid content by pollen species because we are missing needed reference material for U.S. beekeepers. We need a list of regional plants that provide details like the amount of pollen they produce and the amino acid content. As an alternative, I reference an Australian study called Fat Bees Skinny Bees.[21] Although they are Australian plants there are a surprising amount of similarities that provide useful comparisons.

While amino acid references require some digging, there's another way to measure the adequacy of incoming pollen, and it's the time-proven method of simple observation. For instance, if your bees collect a variety of pollen, indicated by different colors, and the brood is pure white and plump, chances are their protein needs are being met. Observation will also reveal the lack of adequate incoming pollen during brood rearing. Since the production of brood food requires lots of pollen, I look at young larvae to ensure that they are floating in a rich reservoir of brood food. Dry larvae can indicate a temporary pollen dearth but if prolonged, it can suggest a larger source-based problem with your area's availability - your bloom calendar and experience will help answer those questions.

Pollen's importance in the ecosphere is undeniable, and for bees the same is true. We often equate potency with size, but in the world of plant fertilization, pollen's silent exchange of genes providing the world with many riches, and its role as a life-sustaining nutrient makes the microscopically small pollen grain a biological giant, one that's both humbling and amazing to observe. Take care of your bees.

Bill Hesbach owns and operates Wing Dance Apiary in Cheshire CT. He's also an EAS Certified Master Beekeeper.

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Beekeeper Nutrition

The Ethics of Food Processing

Christina & Katy **Snoddy**

The pillars of good beekeeping are managing poor nutrition, pathogens, and the effects of pesticides. Cautious steps in every aspect of these increases bee health. Beekeepers are fighting for our bees but are we fighting for ourselves? Let's explore the first pillar. Do beekeepers make healthy nutritional choices?

Beekeepers manage the diets and lives of their bees, testing the viscosity and water content of their honey, or quantifying the number of *Varroa* mites in their hive. Many beekeepers are meticulous about the economy of the hive and monitor everything they possibly can, down to removing drone cells to keep the composition of the hive exactly right.

Most beekeepers are enthusiastic about honey and seek to be ambassadors for honey consumption and use. One fact often quoted is that honey is raw, or unprocessed, uncooked, untouched by commercialization. White or brown sugar, which are ubiquitous in our daily lives do not possess these qualities: they are heated and bleached, a process which leeches the helpful amino acid and minerals from the raw sugar cane. Usually, honey only undergoes one or two process: centrifuging and/or straining, which leave the beneficial side products intact.

Local beekeepers are even passionate about honey they don't make. Beekeepers strive to maintain a high standard of excellency for honey throughout the world, making sure it first fits our desires before we give it to the public. Local beekeepers strive to make commercialized honey producers uphold the same standards they uphold, maintaining the integrity of the honey, including the natural pollen content, which commercialized producers often denude. However, this passion and desire for integrity in honey often does not translate to other food or products besides honey.

Honey is a sweetener, a condiment, a small portion of one's daily food intake. When we buy food, do we take into account the same standards that we maintain for honey? Do we care about how the food is produced? If the food is commercialized? Do we buy and support local farmers or wonder what types of herbicides or pesticides are used in our produce? Do we care that food processing strips the nutritional value out of foods?

Over the course of history, the way we as humans eat and prepare food has changed. Originally, all food was raw. However, with the advent of controllable fire, humans began to cook food, enabling them to travel larger distances and accomplish more mentally and physically. Though methods to preserve raw food, such as salting or icing, developed over time, the next big step in human diet did not occur until World War II, with the invention of vacuum-sealed food packaging. The most obvious example of a vacuum-sealed food is canned food, which most of us have in our pantries. Vacuum-sealing food initially allowed for transport to troops across both seas. After the war, food manufacturers leapt on the idea, which would rapidly accelerate into a multi-billion dollar industry, especially with the discovery of food processing.

Monocultures, or the growth of only one plant, are necessary to deal with the large harvests and high demand for products necessary in food processing. Monocultures disrupt the natural balance in the ecosystem. Monocultures produce food deserts, poor soil quality, and intimately, and often negatively, affect insects, especially bees, who like a balance of nectar and pollen. Monoculture and mass production of food are clearly bad for bees, but they are necessary to maintain the culture of food processing.

Food processing for manufacturing can simply be thought of as altering a food through the use of various chemicals and preservatives for mass transport and shelf life. The International Food Information Council (IFIC) defines processing as "any deliberate change in a food that occurs before it is ready to eat." Under this definition, processing includes pasteurization, dehydration and refrigeration, though there are three stages of processing

classified by the IFIC.

Primary processing ensures food adheres to FDA guidelines. Primary processing includes slaughtering meats, harvesting oats, and picking apples. Products of these processes are called whole foods, which, although "whole foods" is a buzzword, is an actual classification. **Secondary processing** actions are cooking, freezing, and canning. We can think of secondary processing as "simple processing", they can be performed without access to a large-scale, industrial kitchen. The third stage involves adding foreign colors, sweeteners, preservatives, and flavors that are not native to the food being preserved. The third stage produces **ultra-processed food**. It is pretty easy to come up with examples for each stage: a banana is an whole, or raw, food; canned beans are a "simply processed" food; and a candy bar is an ultra-processed food.

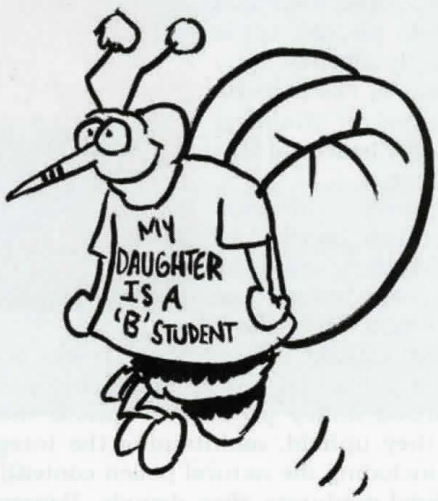
Consuming a food in each stage of processing also has a different caloric effect, or effect on energy. Sweet potatoes are a pretty common food in American life. Let's say, for instance, you wanted to eat a raw sweet potato. You would consume 115 calories. Instead of eating it raw, you bake it in your oven. This would be a form of secondary processing, or "simple processing". You would consume 180 calories. Instead, you drive to your local grocery store and pick up some frozen sweet potato fries, which are ultra-processed. You would consume about 400 calories. The advent of ultra-processed foods are directly linked with higher obesity rates, as you can see from this example. If you're eating more calories, you're going to gain more weight.

Have you ever seen an overweight bee or insect? Probably not. Bees gather food in a way that expends a ton of energy. The food sources are raw and are not available all the time. The weather hinders when food can be gathered. Bees don't have food stored up enough to waste; drones are not allowed to overwinter, since food is rationed, especially during winter. Insects haven't figured out how to process food to gain extra calories.

Let's strive to not only to be good caretakers of bees, but of beekeepers. Nutrition is one of the most important parts of keeping a healthy hive. We should strive to commit to being healthy bee caretakers. We can eat less ultra-processed foods, and instead try to eat raw or simply processed foods. We can support local farmers who practice ethical farming strategies, including limiting insecticides, by eating their raw produce. If any industry knows the benefits of raw foods, it's ours.

PLATE TECTONICS

That's the Editors License Plate – BEEMAG. He has a personal plate that he pays extra for, and he makes a contribution to the Ohio State Beekeepers Association so he has that extra bit on it, too. What we want from you is YOUR STATE'S Plate, with your beekeeping message on it. But this can work three ways – a simple personal plate that says something like BEEMAG. Or a regular plate that advertises your state association, like the OSBA does here, or your plate like this one that has both. Be Proud of your state, your plate and your message. Show the world your BEEMessage. Send a cell phone shot to info@beeculture.com, with PLATE in the subject box. We'll share it with the world.



JONNY HAWKINS

AUTUMN IN SOUTH FLORIDA

Marie **Carres**

As the northern states start preparations for Winter weather, here in south Florida, beekeeping is a year-round event. South Florida is in zone 10, a tropical climate, so it is possible in some years the low temperatures will not make it into the 30s.

One thing is that our queens keep laying eggs or if they do shut down, it is only for a few days. So, you will see eggs, larva and/or brood all the time. It is not uncommon for a hive to end up queenless. The stronger hives will still have drones present, so it is not impossible for a hive to raise a queen from an egg and make it back from her mating flight. But the question that remains is, are there enough adequate drones in the DCA to have a well mated queen?

Monitoring and treating for *Varroa* mites here are constant. It is easy for the mite counts to reach the threshold and treatments are recommended during this time period with the same precautions. Secondary pests such as small hive beetles and wax moths don't die off in the cool weather, seeking refuge in an opportunistic hive or nuc. Especially, when it becomes light on stores.

Our hurricane season ends on November 30th, so with that is the end of the rainy season. During the Winter months we will have periods of dearth, with intermittent light showers. It can be weeks before the next rainfall. So, it becomes important to monitor the amount of stores that a hive has. Here in south Florida a hive can survive with four to six frames of stores. Usually, at this time I'm reluctant to remove any honey supers from the hives and I leave all frames in the deeps filled with nectar located next to the brood.

Robbing also becomes a factor. I reduce all the entrances down, especially on the weaker hives where entrances are reduced to where only one bee can enter or exit. You have to pay close attention to nucs because of their size they are more susceptible to these problems as well as running out of stores.

Under Florida State Laws and regulations, you are required to do your hive inspections once a month. I take my metal cart to the apiary. I place a large piece of cardboard across it and most of the time I take a 2nd large piece of cardboard. When I lift off the super, I place it on the cardboard, then I either cover it with the 2nd piece of cardboard or the lid, which ever seems to be handy. You can then focus on your inspection without worrying about setting off a robbing situation.

Our weather fluctuates with days in the 50s-60s and then a few days later we are in the 80s. Along with brief periods of nectar flows, ranging from a few days to a week, that can come from various types of plants

Panama Rose

and trees such as Brazilian Pepper (*Schinus terebinthifolius*) which listed on the Category I Florida Exotic Pest Plant's Council's (FLEPPC) list of invasive plant species which has spread throughout the state. You will notice the nectar in the super because it will have a dayglow green/yellow color. It almost doesn't look real. The honey that is extracted will have a peppery taste. During the rest of the cool month's periods, the flow is helped with tree called Melaleuca (*Melaleuca quinquenwevia*) which is on the same list at Brazilian Pepper. It blooms when there is a cool snap or when there is rain Fall. The flavor of the honey is nice and pleasant.

We have a weed that blooms at this time called Florida pusley (*Richardia scabra*), Mexican clover or monkey snow which supplies nectar and pollen. It looks like snow spread across the lawns, Florida style. Honey bees will be covered with pollen as they move along from bloom to bloom. But if the rainfall becomes too far and between the plants will stop blooming.

Sometime in December you will see the flower spikes appear on the Mango trees (*Mangifera Indica*) and I noticed yesterday at the first of January honey bees checking out the Cocoplum (*Chrysobalanus icaco*) which is usually grown as a bush. It has shiny green leaves and produced a plum type fruit. There are buds starting to form. Panama Rose (*Rondeletia leucophylla*) which is originally from Mexico grows well here and blooms from November until Summer with star-shaped flowers. Spanish needles (*Bidens alba*) blooms all year-long. It is extremely prolific, and the bees just love it. But it is a considered a weed and homeowners remove it. It is also a nuisance because of the seed

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attachments that show up on your clothes and pets.

Part of my integrated pest management, I use screened bottom boards. In the Winter months I don't close them off. My concrete blocks that I use for hive stands, sit on the flat side, which helps not having a totally open area under the hive. The bees don't seem to mind. But I'm most appreciative is in the Summer months they work great with keeping the hive cool and ventilated when the temperatures are peaking in the 90s.

The most amazing thing that I find living here is that there can be a swarm at any time! Yes, it is true. I actually caught a swarm on 12/31/2017. I always keep a few swarm boxes up. You will see someone post on a local website that they just caught a swarm. Once past the Winter solstice on December 21st, you can notice that the changes in the hives due to the increased daylight.

Finally, Florida is a Winter home for many commercial beekeepers. They transport thousands of hives here for preparation to be shipped off to the almonds in California. Requirements are set by the growers for acceptance of a hive. Some growers request a 10 frame deep an eight-frame minimum of bees that are clustered. Others request 10-12 frame minimum of bees clustered on larger hive configurations. At the end of January is the beginning of transporting across the U.S. to the fields.

Honestly, I have never kept bees in the northern states. I'm sure it has some different and great challenges, because I can wait a few days for the warm weather, so I can look into a hive and make any adjustments that it needs. While the northern beekeepers are hoping that everything is ok in the hive as they wait for that first warm day.

As with anything that deals with weather, we all learn to watch the signs that give us an insightful indication of hive management, hopefully this article gives you a picture of what it is like being a beekeeper in the tropics during the Winter months.

CATCH THE BUZZ

POLLEN COLLECTED BY US HONEY BEES IN URBAN SETTINGS SHOWS DRAMATIC SEASONAL VARIATION

By: Public Library of Science

The diversity and availability of pollen foraged by honey bees across urban and suburban areas in the US varies drastically with the seasons, according to a study published June 12, 2019 in PLOS ONE by Juliana Rangel from Texas A&M University, USA, and colleagues.

Honey bee (Apis mellifera) colonies require a diversity of protein-rich pollen in order to rear healthy brood and ensure colony survival. During certain seasons, insufficient or poor-quality pollen can limit brood nutrition. In this study, the authors investigated the variation in pollen collected by honey bees across developed landscapes in California, Michigan, Florida, and Texas over the seasons of the year.

The authors tracked a total of 394 sites with at least two hives each in urban and suburban locations across California, Texas, Florida, and Michigan. They placed a pollen trap at each hive entrance, which passively collected pollen from foraging bees, and sampled pollen from the traps in multiple months of 2014 and 2015. The researchers used a light microscope to identify pollen grains to the family, genus, and species level where possible.

The total overall pollen species diversity varied significantly across all four states, with highest diversity in California and lowest diversity in Texas. Nationally, the total pollen diversity was significantly higher in the spring across all locations as compared to other seasons. Top pollen sources across all states included legumes, oaks, roses and daisies. Only a few plant groups provided pollen throughout the year—for example, eucalyptus and palm pollen was consistently available in California and Florida.

Since pollen traps were only in use over limited periods, the assessment of pollen collection was not comprehensive, and the pollen was not quantified to examine the proportion collected of each type. However, these results provide information about honey bee foraging patterns over the year. The authors hope this might help urban planners and gardeners choose plants that can provide appropriate pollen resources to honey bees in developed areas year-round, and plan pesticide treatment regimens around honey bee foraging schedules.

The authors add: "This study describes the seasonal and geographic variation of floral sources of pollen for honey bees in urban and suburban landscapes, giving us for the first time a comprehensive look at some of the most important plants for honey bees in developed areas, and serves as a foundation for studies related to honey bee nutritional ecology in urban settings."

Winding Down For Awhile

Ann **Harman**

The bee calendar on the wall will be turning to the months of late Autumn, then early Winter. Queens, whether living in hives in the northern states or the much warmer South, are going to take their Winter "vacation" for a well-deserved rest. However, you are not finished with your bee year yet. Your next projects are important one so do not plan on putting them off.

Now is the time to review your beekeeping records! So, scramble around for those scraps of papers you scribbled something on. Dump your bee bucket out on the floor—find any scraps? We'll come back to the bucket later. Check all the pockets of your bee clothing. Now that you have done that, why not go ahead and toss it in the washing machine.

As bees get caught in clothing they can sting it and leave behind drops of venom. This will dry between wearings and will be invisible. However, it can become a source of venom allergy as the dried venom gets dispersed in the air and inhaled, not only by you but also others in the household. Beekeeper gloves can also carry dried venom. So, they need a good wash also. Disposable gloves can be discarded now. There's the start of a shopping list for the upcoming bee year! Start it now! You'll be adding to it soon.

While you are washing your bee clothing give your veil a wash, according to instructions for your type of veil. This is especially important if you are in African bee areas where the bees will bounce off your veil while ejecting venom. That will dry on the veil and become a source of venom dust. For African bee work it might be good to wash off your veil from time to time during bee season.

Scraps of paper, notebooks, information put on cell phone, put into computer all need to be reviewed. You are looking to complete a story of each hive during the year. It is going to cover what the bees did, what you did, when you did something and what happened. Did you need help from your mentor? Was there any problem? Was it resolved? As you are doing this review you will find ways to improve your record keeping.

You may have taken some photos with your cell phone of frames of bees —doing something. Or perhaps it was supposed to be a photo of a nice queen. It actually turned out to be a photo of—blurry bees doing something. Review your snapshots to see if there are ones that convey some information and help to complete your records. Go ahead and keep the useful ones provided you know why you are keeping them.

Did you set up your own record keeping program on your computer? Many beginning beekeepers decide this system will make more sense to them than using a paper notebook whose pages stick together with honey and propolis. However information does have to be transferred immediately or some vital bit may be forgotten.

A little over ten years ago two beekeepers realized both that hive records are important to good beekeeping but "home grown" formats on computers may not be the best approach to keeping records. That was when HiveTracks was designed. Over the years the formats were refined so that today the small-scale beekeepers now have available the HiveTracks Hobbyist Platform, designed for those beginning beekeepers and others with a small number of hives.

To find an excellent description of this new software platform please visit the April 2019 issue of *Bee Culture*, pages 35–41. There you will discover diagrams and explanations of the information you can obtain from each of your colonies as they go through their bee year. Just think—you won't have to depend on scraps of paper, sticky notebooks, and your memory. Your bees will be better the coming bee year.

Now that the important record keeping has been reviewed and chosen, go back to that bee bucket that you dumped on the floor. A quick look at the hive tools shows that they will have to be cleaned up. Wax, propolis and gunk needs to be scraped off. If the weather is cold you can put them outside to get cold, making it easier to snap off lumps. Do whatever you can to make the hive tools really clean so there is no

chance of transferring disease. As you are inspecting hives next season you can always give them a quick trip in a lit smoker to melt off debris. With the bucket contents all over the floor now you can see that hive tool that you won as a door prize. You tried it once but it doesn't fit your hand. Take it to the next bee club meeting. Someone there might really like it. As you replace all your things back into the bucket it gives you a chance to add to your shopping list. Also you may be reminded about some gadget you thought might be useful, such as a frame holder. It's such a simple gadget but can be most valuable in keeping frames full of bees—and possibly the queen—from falling over on the ground leaving bees wandering around in grass or sand. If you don't have one, put it on a bee equipment shopping list. Check the roll of duct tape, smoker lighter and other bits and pieces you find useful.

Now that the bee bucket is done pick up your smoker. Cleaning this up is best done outside. Empty out any accumulated ashes under the inner grid. Creosote can gum up the closing rims. Cleaning those up will really help. Check the bellows for any damage or holes. Once you are sure all is well, your smoker can be considered ready for use. (That task didn't take that long.) How is your supply of smoker fuel? Put it on your shopping list if your supply won't get you through the first very busy months.

The next item for your inspection is your beeyard. Here conditions depend on where you live—warm or cold climate, sand or grass, hilly or flat, wet or dry. While you walk around it go back to any thoughts you may have had throughout the bee year. Do you see any abandoned equipment lying around? It is not doing you or your bees any good there. Now walk around again to inspect the hives themselves. Although you are just looking at the outside you want to be certain all the parts are lined up, covers are secure. If you made any notes in your records about the condition of woodenware actively in use, go back and review those records. The equipment suppliers frequently have equipment sales in January so take advantage of these for needed replacement parts as well as for starting new hives or nucs.

Those beekeepers in "critter country" with such pests as skunks and bears know that the electric fence, of whatever type, is their most valuable piece of equipment. So your next walkaround will be concentrated on the fence and its charger. Although you might not expect critter problems during your Winter, you still want your fence working, "just in case...."

You're not finished yet! It's time to move inside where you have stored your bee equipment—woodenware. If you had a honey crop during this bee year, you may have some stored honey supers. If they are in plastic bags, check the bags over carefully. It is so easy for a mouse to chew a hole in a bag and proceed to make a mess sight unseen. Make a note to check these throughout the Winter.

Did you happen to record the condition of your honey supers before storing them? Honey flows can seem to just pop up suddenly in some years. Unfortunately, we really cannot predict exactly what the next honey flow time will bring, it's much better to be ready for it than contacting equipment suppliers when everybody else is in a state of panic.

Carefully review all queen excluders if you use them. Any small area damaged will be found by a queen. She spends all her days in the hive; you are only inside the hive for a very short time. This is one piece of equipment that needs to have a carefully chosen storage place. Another item that needs safe storage is frames of good, useful drawn comb. If you have some useful comb left from a dead colony it can be used for the coming bee season if you are certain that the colony did not die from disease. Check frames and clean up any built comb that is unsuitable. It will not be used so there is no point in keeping it. Check any hive bodies, screen bottom boards, inner covers and tops. Pay particular attention to any sugar syrup feeders you used this year. Feeders can get mold forming while in use, especially with 1:1 syrup. While the weather is still suitable, get busy with scrub brushes, hot soapy water, sponges, garden hoses, and some rubber boots. Using some bleach give the feeders a thorough rinse, then flush with water. Dry completely before storage and protect from dust. If you don't like the style of feeder you chose, add a different one to your shopping list. Decide what items need repair and repainting or replacing. If you were able to extract some honey this year, review your supply of containers. They also need a clean storage area. All the stored equipment has now been reviewed. Add to your shopping list.

Now it is time to sit down with a cup of tea sweetened with honey and review. Consolidate your shopping list. Personal gear—you might decide to use a different style veil. Bee hives—you've been curious to try a plastic hive. Making nucs might have been on your list to try this year. Now is a good time to look through the advertisements in beekeeping magazines. You can go online to several bee equipment suppliers to help you decide your coming bee year.

Yes, I asked you many pesky questions; however, being ready for the upcoming bee year will really get it off to a good start. Well, at least with the bees and your equipment and your beeyard. Now we hope Mother Nature can control her tantrums of extreme weather so that the plants and the bees can form their partnership, then all will be well.

SuperDFM-HoneyBee

Vyacheslav **Strogolov**

Interest in gut microbials.

Early 20th century Noble Prize-winning biologist Ilya Metchnikoff hypothesized that host-friendly bacteria found in yogurt were responsible for the health and longevity in a unique population of Bulgarian villagers. The term "microbiome" was coined later by Noble Prize-winning biologist, Joshua Lederberg. The work of these biologists led to the modern understanding of host-microbiome interaction.

Human probiotics (from Greek probios, for life) help immune system development and treat gastrointestinal discomfort. Growing up in Russia and Ukraine, my family and I took a highly concentrated probiotic along with our vitamins. Freeze dried cultures of Bifidobacterium or Lactobacillus were considered gold standard in nurturing a healthy gut and overall health.

After serving as a medic in the U.S. Army, I met my wife, Vera. We were both interested in biology and enrolled in University of Wisconsin-Milwaukee graduate school. I was fortunate to study immune function using microscopy. This work had me marvel at the delicate balance between productive and unproductive immune responses.

After graduation from University of Wisconsin-Milwaukee, I started working on a project focused on immune cells of livestock animals. Through this work I became aware of probiotics for livestock animals, or Direct Fed Microbials (DFM). DFMs improve animal health, suppress pathogens, increase weight gain, and improve digestion. For example, microbial silage inoculants improve nutrition and increase milk production. Mentorship of academic and industry experts, Dr. Julie Oliver and Dr. Greg Siragusa, was invaluable during this time in my career.

In 2012, I began manufacturing my own microbial products in Milwaukee, Wisconsin. Milwaukee is a city on the water renowned for manufacturing, surrounded by agriculture, and home to many academic institutions. Not only brewing and cheese-making traditions make Milwaukee a center of fermentation and microbial knowledge. With the first activated microbial sludge sewage treatment plant in the world build in 1925, Milwaukee pioneered bioremediation and started Earth day. My goal has been to deliver sustainable microbial solutions, to improve agricultural processes and conserve resources.

Strong Microbials started with silage inoculates, poultry and swine DFMs. The name, Strong Microbials, was purposely chosen to contrast the small size and great potential of microorganisms. Better products are created through better ingredients and continuous research.

We deliver our microbial products in a freeze dried (lyophilized) form. Lyophilization, also called cryodessication, is a low temperature dehydration process which involves freezing the product, lowering the pressure, to remove ice. This is the method used to make freeze dried strawberries and other food products. This method is a preferred standard in the industry to achieve best shelf life and highest concentration of live microorganisms.

Introduction to beekeeping.

To better understand our customers, I was sending surveys, asking questions and visiting many farms in person. One such meeting with EAS Master beekeepers Earl and Carol Hoffman ended with a request to make a probiotic for honey bees. That year, TIME magazine ran a cover with a pessimistic message: "A World Without Honeybees". These two events led me to beekeeping and the development of SuperDFM-HoneyBee.

Months of carefully reviewing scientific literature led to the formulation of SuperDFM-HoneyBee. The goal was to stimulate honey bee innate immune responses with *Bifidobacterium bifidum, Lactobacillus acidophilus, Lactobacillus plantarum* (Evans and Lopez, 2004). *Bacillus subtilis* was added to improve colony performance (Sabate et al., 2012). *Bacillus pumilus* and *Bacillus licheniformis* were added to protect honey bee colonies against infectious diseases, because they were shown to inhibit growth of pathogens such as *Paenibacillus larvae* (Alippi and Reynaldi, 2006). In addition to pathogen suppression, *Bacillus licheniformis* also increases nutrient assimilation by breaking down the pectin in pollen walls (Praet et al., 2018). *Saccharomyces cerevisiae* and selective digestive enzymes assist in digestion and nutrient uptake in honey bee workers (Al-Ghamdi et al., 2011).

We started feeding SuperDFM-HoneyBee to our bees. Earl and Carol, who suffered a catastrophic colony loss the previous Winter, had a much better Winter that year with SuperDFM-HoneyBee. Earl and Carol, committed to beekeeper education, spread the

word and introduced me to the beekeeping world. I am so thankful for the conversations with beekeepers and entomologists who helped me understand how to make this product better. SuperDFM-HoneyBee became the first product of its kind in North and South America, and a new tool for beekeepers. Importantly, probiotics minimize the need for antibiotic treatment.

Imitation is a highest form of flattery.

At the time, there was no product similar to SuperDFM-HoneyBee. We received an outpouring of positive outcomes from beekeepers across the country recovering from chalkbrood, foulbrood, and nosemosis. Strong Microbials team grew, so did my apiary. We are now overwintering 24 hives on the roof of our manufacturing facility in Milwaukee, Wisconsin. Every employee takes ownership of the bees and the quality of our products.

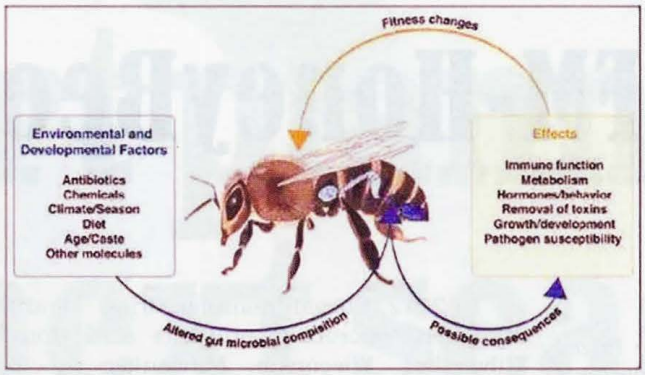

Figure 1. Honeybee is carrying millions of tiny passengers. Factors influencing gut microbes include environmental chemicals and antibiotics and their functions include removal of toxins and influence bee fitness (source: Raymann and Moran, 2018).

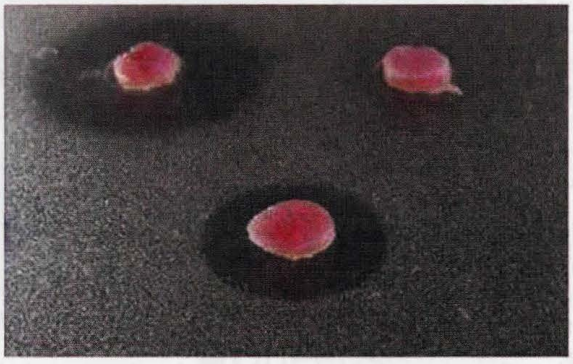

Figure 2. Microbial inhibition assay. Microbes cultured on a solid nutritive agar (appearing as tiny white dots) are tested in antibiotic inhibition assay. In this assay, 2 out of 3 meat samples contain antibiotic residues, which inhibit growth of bacteria (source: Pikkemaat, 2009).

It looks like we made waves! Since its inception in 2012, many microbial supplements and products of all forms and types have sprung up. There are imitation products as well as new ideas. A number of different varieties as well as delivery methods exist (liquid or syrup, pollen patties, pills, dry powders).

Public interest in gut microbials and microbial functions is steadily increasing. Hobby beekeepers tell us that they are feeding homemade kombucha to bees (I haven't tried this, I will try to set up a test soon). Better yet, beekeepers and farmers are finding sustainable microbial products to be economically rewarding.

We are aware today of the microbial universe that surrounds us. Bacteria produce nutrients, therapeutics, shape our immunity and prevent disease. Research projects on bee gut microbes are ongoing in US and Canada. Many are initiated by beekeepers' request, and many led by USDA scientists, including notable quest for honey bee larva microbe *Parasaccharibacter apium*. Annual number of scientific publications on "honey bee gut microbial" went from two to ten!

Looking forward.

Since the introduction of our first probiotic product, SuperDFM-HoneyBee, six years went by and we observed colonies surviving, becoming stronger, owing in part to substantial reduction of Chalkbrood and Nosema infections. Strong Microbials continues researching microbial products, with a goal of finding microbial solutions to all of honey bees' problems. Two projects currently underway are a microbial control of Small Hive Beetle and microbial control of *Varroa* mite.

Strong Microbials also added to our list of products BioMantra microbial soil, root, and seed inoculants. These microbial products form mycorrhizal associations and increase nutrient availability to the plants. I'm inspired by my thriving garden and the words of Jonathan Lundgren, "if you want to heal the bees, heal the soil". Strong Microbials continues to grow and seed the world with diverse, beneficial microbes. For many years, I attended Milwaukee Microbiology Society, where the saying goes, "Support bacteria. It's the only culture some people have!". Bee well, be cultured and stay educated.

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Cooking With Honey

Ann **Harman**

Thanksgiving is a holiday celebrated with family and also friends. The traditional foods served claim to be handed down over the centuries when the harvests came in. However if we could jump back in time and sit down to those foods we would probably not enjoy them nearly as much as what we consider traditional today. This year could you break with tradition just a little and possibly add some new family favorites to your Thanksgiving feast? Try these, along with your usual harvest specials.

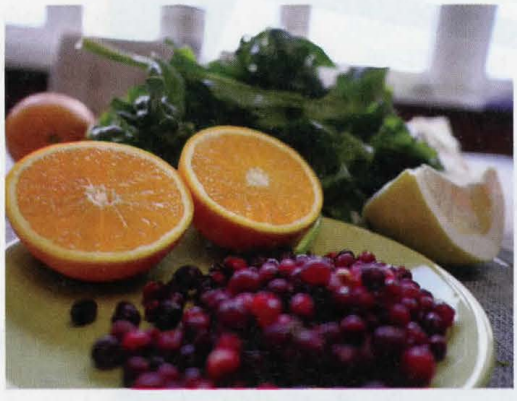
OLD FASHIONED OATMEAL PIE

½ cup butter or margarine
¾ cup honey
2 eggs, beaten
¾ cup quick-cooking rolled oats
¾ cup coconut
¾ cup brown sugar
½ cup currants
½ cup chopped walnuts
9-inch unbaked pie shell
whipped cream, if desired

Combine all ingredients except pie shell and whipped cream. Mix well. Pour into pie shell. Bake at 350°F for 40 to 45 minutes or until filling browns and knife blade inserted in center comes out clean. Cool. Top with whipped cream if desired and serve. Makes 8 servings.

Cranberries, by themselves do need quite a bit of sweetening to make them enjoyable. I am sure the settlers, way back then, must have used honey to make them edible. There are usually a couple of traditional cranberry sauce recipes that have become expected on our Thanksgiving tables. However, this recipe really makes a surprise addition to those recipes. Try it! It may join the traditional ones.

CRANBERRY SALSA



2 cups fresh or frozen whole cranberries
1 orange, peeled and chopped
1 tablespoon grated orange peel
1 tablespoon minced fresh gingerroot
1 tablespoon chopped fresh parsley
1 tablespoon chopped fresh cilantro
1 jalapeño pepper, seeded and chopped
⅓ cup honey
2 tablespoons thawed frozen orange juice concentrate

Coarsely chop cranberries in food processor. Add orange, orange peel, ginger, parsley, cilantro and jalapeño pepper. Process 30 to 40 seconds or until mixture is coarsely chopped. Add honey and orange juice concentrate. Process about 5 seconds more. Serve with turkey or other poultry. Makes 2 cups.

You might like to serve this butter for the hot biscuits or rolls.

SPICED HONEY BUTTER

½ cup butter or margarine, softened to room temperature
¼ cup honey
2 teaspoons grated orange peel
1-1/2 teaspoons pumpkin pie spice

Combine all ingredients and mix well. Makes about ¾ cup.

All recipes from National Honey Board