SEP 2010

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INSIDE . . .

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Artist Marie App of Ogdensburg, WI was commissioned to paint this scene by Steven Hupfer, a WI beekeeper, to be raffled at the WI Honey Producers meeting to be held this November, in Manitowac, WI. It is entitled, appropriately, Milk and Honey. If you're interested in obtaining this, we're sure the WI Honey Producers will be happy to share their raffle tickets.

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Bee Culture

THE MAGAZINE OF AMERICAN BEEKEEPING

SEPTEMBER 2010 VOLUME 138 NUMBER 9

FEATURES

DEPARTMENTS & COLUMNS

GLEANINGS-73, CALENDAR-76, CLASSIFIED ADS-77

Sharpen Hive Tools

May I question the sharpening of a hive tool?

The hive tool was a remake of the paint scraping tool. The paint scraper had a 100° angle on the bent end whereas the hive tool has a 90° angle. That makes for a non-slip prying tool. The paint scraper was also blunter or of heavier metal at the straight end whereas a hive tool has a thinner metal blade in the last two inches of the tool. This is what makes it easier to slide between two boxes as a prelude to prying in order to separate the two boxes.

In the warmer Summer months the unsharpened tool will slide easily between two boxes and will just as easily scrape burr comb from the frames and inner cover. There just isn't any resistance from the wax or propolis. In late Winter or early Spring the propolis and beeswax are harder and require a bit of effort to scrape. This is the time of year when most scraping is done.

The problem is, you must hold the frames steady with one hand and scrape with the other. At least once a year the tool slips and hits the other hand. If you are using a sharpened tool you now have a rather deep cut which will require stitching. The sharpened tool will now cost you at least $400 for the emergency room visit. Hopefully you won't be too far out and bleeding badly.

Another problem with that sharpened tool – without ever sharpening my tools in 32 years, if scraping a frame top bar against the grain of the wood the hive tool digs into the wood and you must reverse the frame and scrape in the other direction, with the grain of the wood. If my tools were sharpened it would increase this problem dramatically.

I've had and still have four hive tools in my years of beekeeping and they are all cutting quite well without ever having been sharpened.

J. Michael Haas
Painesville, OH

Editor's Reply: The one-size-fits-all hive tool works for many beekeepers. For me though, it's like a one-size-fits-all screw driver. It's really good for some things, not so good for others, and not good at all for the rest. Everything you mention is correct if you never change...but my take is that with several different styles of tools you won't have stitches in the winter, the split wood or smeared propolis or torn burr comb in the summer. So the hive tool I keep handy when examining a colony has a sharp end for removing soft comb and propolis, and a flat end for hard scraping that doesn't gouge the wood . . . different tools for different tasks. And I want that sharp end sharp because when it gets dull it pulls and breaks rather than cuts and my bees seem not to appreciate the disruption. Back in the workshop there's several more that I use...again for different tasks. So if you have had one tool for over 30 years, it's the right tool for you. And if you use five or six tools like I do, they are the right tools for me. That's the thing I like best about keeping bees . . .

Back a few years ago we did a 125 year review of our magazine, looking at several years for each month of the celebratory year. In 1905 there was the first drawing of the hive tool we use today, made by a beekeeper and first sold by the A. I. Root Company. It may have been modeled after a paint scraper but the inventor didn't say, but the bevels employed in that tool are different than paint scrapers today, and that old tool works fine.

Beekeeper Profiles

Like most of you I am a beekeeper. I started last year, and plan on taking the test for my Master Beekeeper's Certificate when the timing is appropriate. I have a "Bee Sensei" I will be studying with for the next three years. I am also a professional writer and playwright and worked in Municipal Administration most of my adult life.

I am very interested in collecting as many memoirs of beekeeping experiences including getting started, first experiences, tools needed, different hives, disease, fun, pleasurable experiences and not so pleasurable experiences, scientific data, types of bees and why, winterizing, grants, funding, novice and master beekeeping tales as well as the processes of queen rearing and whatever else you can dream up.

I will need a release to print your story – in return I plan on having a directory in the back of my book for bee farms, bee supply houses, Nuc sales, bee sales, queen breeding/sales, equipment, etc. I am happy to include your name and specialty if you are chosen for the book. I will send either a letter of acceptance which will include further instructions – or a letter of rejection wishing you all the best in your ventures in beekeeping. Be assured – you will receive a response from me personally – one way or the other.

A little about me: You might be wary not knowing me personally, but I have written for several different publishers over the years opening with subjects ranging from horse purchases over the internet, to ruby glass collecting, to antique sword collecting. Some of these publications include Point of View Publications, Blood-Horse Publications, Militaria International Publications, Virgo Publications, Krause Publications, CanPlay of Canada, and Harris Publications. In addition, I have written various newspaper and magazine editorials. My interviewees include a number of remarkable people such as Jim Lehrer of PBS fame, and Canadian playwright David Carley in regards to his staged version of Margaret Atwood's The Edible Woman in Canada.

I have also had my play *Potato Chips* produced by the Catherine Lindsey Actors/Playwrights Workshop in Darien, CT and sponsored by the Darien Arts Center July of 2003. My play *Final Copy* was performed by the Catherine Lindsey Actors/Playwrights Workshop in Darien CT June, 2009. My play *Body Shop* is being produced by

the Catherine Lindsey Actors/Playwrights Workshop in Darien, CT this Summer, June 13, 2010. My plays *Potato Chips, Final Copy*, and *Body Shop* are all being considered for future production at the Palace Theatre, connected with Colgate University, in Hamilton, New York, as well as Slant of Light Theater in Norwalk, Ct.

I am currently writing a timely fiction novel entitled *Queen Bee*, the genre being Eco/Political/Suspense, as well as this compilation of bee related memoirs entitled *Profiles of the American Beekeeper* which will both hopefully be picked up quickly and published – while waiting for a job position to open up for me.

In three years I plan to live a self-sustainable existence on our 35 acre farm with honey bees – so far we have Russians, Great Pyrenees dogs, Ramboulette Sheep, and Champagne D'Argent Rabbits.

Please email submissions and pictures to me at **hive5555@hotmail.com** or, even better, mail me your stories and hard copy pictures to me personally at my NJ address:

Mrs. Mary C. Charest
Professional Writer and Playwright
608 Washington Drive
Ramsey, NJ 07446
Re: *Profiles of the American Beekeeper Submissions*

Is It Pure Honey?

I have a simple question. What is used to test honey and assure its pure honey? Are there agencies that test for such?

I want to make sure someone else in the surrounding area isn't open feeding their bees. I simply want to know my honey is pure.

If there isn't an at-home test is there a place I can send a sample?

Also, is there anywhere I can send honey samples to determine the source of nectar?

Bert Clayton
Ladson, SC

Editor's Note: *For some help in this area visit http://projectapism.org*

Still Kicking

This is in response to a letter to the editor from Bruce Guiliani in the July issue. At five foot six and 145 pounds, no blubber involved, I have fallen many, many times from heights up to 16 feet and am still kicking. OSHA didn't get their statistics from my life or they would have discovered that one out of every five Falls results in a fractured bone or two. I imagine Bruce never drives a car as it is very dangerous to do so. And he must also wear two beesuits to work his bees as this is also very dangerous. I use the top rung of a ladder for what it is obviously made for, to stand on. I am only 20 and expect a few more falls before I keel over.

To *Bee Culture*, you publish a great magazine. Keep it up, espe-

cially those pictures of beekeepers just straining to reach a swarm.

And hey, Kim I do appreciate not having to dig around for the rest of your article this time.

Josh Sommers
Cincinnatti, IA

Mitegone Treatments

The following is an ABSTRACT of three years of treatments and testing leading to virtual elimination of mites in 500 hive pollination and bee breeding operations. All tests were supervised and mites on boards counted by provincial bee inspectors in B.C. Canada. **Individual test charts are available in hand written form by fax.**

PRINCIPLES ADAPTED AFTER 12 YEARS OF EXPERIENCE IN 2006

• **Only natural drop tests before each treatment** and at the same time of the year (in moderate climate August and April) will tell you the true situation in the hive as mite levels directly effect the Winter and Summer brood and bee stock.

• **The results of testing at other times, by other methods, randomly and after the treatment, are irrelevant.**

• **Tests after the treatment**; in many instances, the natural drop after the August treatment was higher than before the treatment. Why is this? It is because mites exposed to the acid continue to die in great numbers long after the treatment has ended. They become sick, sterile and in 80% will not reproduce; their offspring and many adults die in capped cells. Also because Summer mites are just dying off in late September and October? **The only true measure of August treatment success is how many mites are in the same hive the following Spring and vice versa.**

2006 August: Was the last time we used **Fluvalinate** in general population of hives:

Tests proved resistance to Fluvalinate in the mid to high level with efficacy multiple of 2 – 3 – 3.5 - 0.8 and 11 respectively on five hives. THIS IS VERY LOW FOR PESTICIDES.

The formic acid efficacy multiple on two groups of five hives treated with two pads had an average of 4.5 and 5.0. In five hives, treated with three half pads the efficacy multiple average was 15. VERY GOOD.

Efficacy multiple is: *how many times more mites drop in the first day of treatment, over the natural drop before treatment. (See testing on www.Mitegone.com)*

The natural 24 hour prorated drop average before the treatment was six to seven mites. This is a good result of Spring treatment with Formic acid in the MITEGONE method.

DECISION

The test results lead to an instruction revision to use three half pads in August, two in Spring, and exclusive use of formic acid and Mitegone pads throughout all operations becoming standard.

2007 April: 10 Hives treated with acid in august had an average 24 hour drop before treatment of 1.5 mites. 10 hives treated with Fluvallinate in the Fall had an average of 17.83 mites, confirming the above decision to be correct.

2007 August: This was the last year we used Fluvalinate on 10 test hives only; to confirm our **Decision**. All hives were treated in the Spring with two pads of acid and the highest prorated 24 hour drop was 2.28 mites. Four hives out of 20 had two mites. The rest of the hives had one or less mites. Two of the hives had zero mites.

Again confirming **"Decision."** correct.

AT THIS POINT I HAVE TO PART FROM THE ESTABLISHED PRORATED 24 HOUR DROP, BECAUSE THE DROP NUMBERS ARE

BECOMING SO LOW AND 1/3 OR 0.19 OF A MITE MAY CONFUSE SOME READERS.

2008 April: The numbers are for a 96 hour, four day drop.

The 10 hives treated in the Fall with Fluvalinate all had mites; two1, four 3, one 0, 5, 13, & 20.

The 10 hives treated with acid had five hives with 0 mites; three with two, one with one, and three mites.

This represents a 24 hour average drop of 0.25 mites.

2008 August: The test hives were treated with acid in yards before being brought to the test circle, making testing redundant.

THE NUMBERS OF MITES ARE GETTING SMALLER. WE SETTLED ON DROPS IN 72 HOURS/THREE DAYS AND TREATMENTS WITH 65% FORMIC ACID IN MITEGONE HALF PADS METHOD.

2009 April: All hives treated in the Fall with three half pads. **Out of 20 hives, one had two mites and a second hive had one mite. Rest had zero mites in three day drop.**

2009 August: All hives treated with two half pads in April. **Out of 20 hives, one hive had six mites, one five one three mites, three had one mite, and 14 hives had zero mites. Again in a 72 hour, three day, drop.**

2010 April: All hives treated with 3 half pads in August. **Out of 20 hives one mite was found, and the rest had zero mites. This was again in a 3 day, 72 hour, drop.**

TRANSLATED INTO 24 HOUR PRORATED DROP IS 0.016 MITES "VIRTUALY NONE".

Bill Ruzicka
Kelowna, BC

INNER COVER

Here's a statement I heard at a meeting I was at in late July at Alfred College, in Alfred New York.

The speaker said, ". . . and beekeepers need to manage the complex microbial communities in honey bee colonies."

Like we need one more thing to manage, right?

Let me give you some background.

For nearly ever we've been told that our bees are safe when they visit flowers that have been sprayed with fungicides because fungicides don't harm bees. The scientists who do these things sprayed adult bees to see if they died. (The government seems to have outsourced this task to the companies that make the chemicals. It's easier that way, and cheaper, too.) They didn't. So fungicides are safe. Spray at will, anytime of the day or night, any time at all. It's OK. Don't worry. So farmers did, and still are.

But guess what. Either the scientists were wrong in the first place or the fungicides have changed. It's probably both because back then they didn't look long term and if bees died in a week or two, or there was a major break in the brood cycle, or if supersedures skyrocketed . . . it certainly wasn't the fungicide because fungicides don't harm bees. But fungicides have changed. Dramatically so. They are systemic now (of course there were systemic fungicides before, but they weren't considered a problem because they were 'inside' the plant, not on the surface). And they are more active now, and more toxic now, and work in weird synergistic ways when combined with spreaders, stickers, antibiotics and other fungicides. So OK, hold that thought for a moment.

Here are some fundamentals of honey bee nutrition. Honey bees collect pollen. You knew that. But did you know that microbes, bacteria and fungi and such that are resident in the bee's honey stomach and got there from other bees, and are also in the hive itself act on that pollen, causing fermentation, much like chopped corn turning into silage. Fermentation compromises the pollen grain's cell wall, transforming the pollen into bee bread that allows it to be digested by the bees. When it has been transformed into beebread, it first and foremost serves as food for the workers where it helps maintain a healthy immune response to a variety of ailments. This, as you might suppose, greatly contributes to worker longevity. When consumed, healthy workers also turn bee bread into brood food, that is worker and drone jelly, using glands in the head and feed it to worker and drone larvae. If all goes well, the next generation grows up big and strong and healthy. Workers also convert bee bread to royal jelly to feed to queen larvae so they start out right, and then to adult queens so they stay that way. Good royal jelly enhances egg laying and pheromone production, and is the major component to queen longevity.

Back to the fungicides. So what happens is, plants in bloom are sprayed with fungicides because the diseases the fungicides control attack the fruits and nuts in question right at blossom time. Foraging honey bees visit the flowers even while they are being sprayed and pick up pollen, and maybe even nectar that has this fresh-out-of-the-sprayer fungicide all over it, and they bring it home for future food. Immediately, these chemicals begin their evil work. While still in the bees's honey stomach, they destroy the microbes responsible for the fermentation process necessary for the bee bread conversion. Fungicides do kill fungii, after all. The pollen doesn't get converted, the bees can't digest it and the colony can't use it. Besides that, those can't-live-without-them microbes that were so handily dispatched by these chemicals not only cause pollen fermentation, but they also produce antibiotics in the honey bee's system, plus fatty acids, and enzymes that digest starches, proteins, sugars, plus dissolve the cell walls of pollen grains so they can be consumed.

But these microflora are distressed by other environmental compounds too . . . antibiotics (you don't use those do you?), and, interestingly, both sugar and HFCS. It's been noted that honey bee colonies that have been stressed because they have low levels of these essential microorganisms have a higher incidence of disease, especially chalk brood, have workers that live shorter lives, and because of a stressed childhood, and as an adult poor pheromone and egg production due to poor food quality . . . high rates of queen supercedure. As a result . . . colony growth is stunted, or the colony may actually perish.

So bees starve to death in the midst of plenty. Oh, there's plenty of pollen. Just not nearly enough bee bread.

Maybe this doesn't happen to your bees. But here's an itinerary one pollinator has . . . his bees go from almonds to apricots to cherries to apples to sunflowers to cranberries. He makes a killing in the pollination business, but the pollination business is killing his bees.

So, before it's too late, get out there and manage those complex microbial communities, OK?

And when you figure out a way to stay cool in the beeyard, let us know. I'm meltin' out here.

•

Due to an unprecedented alignment of the planets, EAS, and a computer communication glitch between us and our printer, the magazine was mailed late. We regret any inconvenience. The appropriate rascals have been severely punished.

Kim Flottum

Community Management

New For The Beekeeper -

One of the issues with an oil tray style hive beetle trap is reduced ventilation when the oil tray is in place. Beekeepers in areas with a constant beetle infestation, the oil tray needs to be in place all Summer. This new ventilated design of the Freeman Beetle Trap solves the ventilation issue and continues to kill hive beetles as they fly into the hive.

Used in combination with the Ventilated Freeman Trap, our screened inner cover produces a chimney effect to remove the hot, moist air from the hive.

Available fromAshley Bee Supply, Home of the Original Freeman Beetle Trap, Hamburg, Arkansas; 870.853.2412 Visit our web site at: **www.freemanbeetletrap.com**

Bee Dun
a Product from BeeOlogy

The new repellent for bees. To run bees out of your supers easily for your honey harvest.

A new non-toxic, biologically safe mixture of herbs and essential oils that won't harm your bees or your beehive. No foul smell or residue. The new Bee Repellent for your fume boards.Go to http://www.beeology.com to check out prices and sizes or call Dave Duncan at 419-683-4154.

We encourage Beekeeping businesses and entrepreneurs to show off their new products on this page. Send us a short write up, a photo or even the New Product itself for us to try and to photograph, and we'll show it to the whole world. It's free, it's the second most read page in the magazine every month (The Mail is always first), and you won't believe how much attention you will receive when we show it off for you. Send your electronic photos to the editor at Kim@BeeCulture.com, along with your information on what it is, how it works, and where folks can find out more. Send an actual new product or a hard copy photo to the editor at 623 W. Liberty Street, Medina, OH 44256.

Honeybee Democracy. Thomas Seeley. Princeton University Press. 280 pages, 8" x 9". Color throughout. ISBN 978-0-691-14721-5 Hard Cover. $29.95. Due October, 2010.

Tom Seeley is a professor of biology at Cornell University in Ithaca, NY. He has previously published The Wisdom Of The Hive, and, Honeybee Ecology. If you are serious about honey bees you have these two books at home and you've read them three or four times. Maybe more. Add this new book to your list.

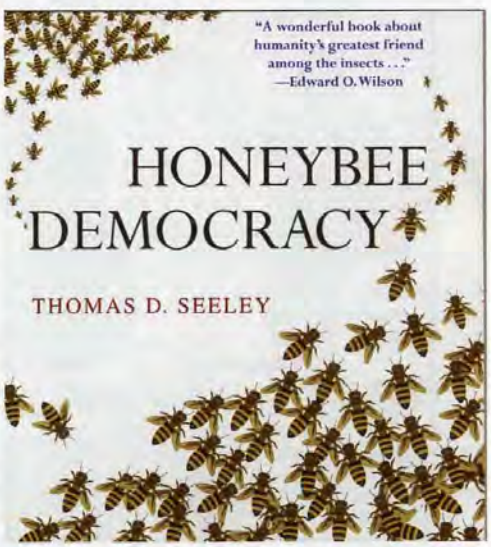
This new book is about a very specific topic...how swarms find a new home. It won't help you make more honey, or get stung less, but it is a window to what is undoubtedly the most spectacular biological event beekeepers get to routinely be a part of. We consider that act of swarming a nuisance at best, and a sign of failure if we are not able to prevent the act. You'll appreciate it more after reading this book.

But Dr. Seeley only sees the magic of the event, and throughout these pages explains, in infinite detail, and in elegant text how this occurs. Some of this information has already been published, much of it by him and his cohorts from previous studies. But much is new, and all of it is exciting.

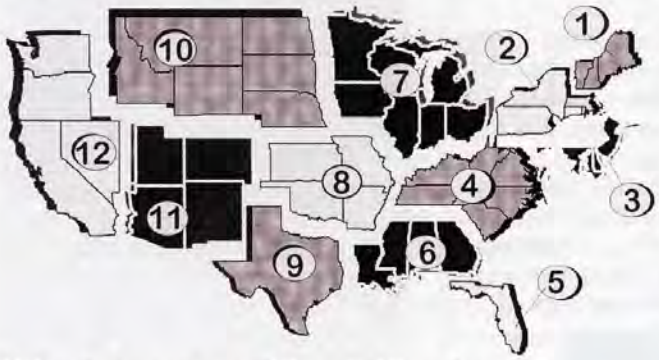
The section I found incredible was the information on how all those bees, once they leave their bivouac area after having decided which of the many new homes the scouts have found. When they leave, they start slow, speed up, maybe stop to rest if the queen is tired, take off again... and then, they slow down right before they reach the new home, a few scouts are at the entrance, then a few more, then more and in a matter of minutes the bees are piling into the new home. Incredible.

Well, it's streaker bees that lead the way...zooming through the swarm at a much faster speed than most of the bees, while the mass of bees see them racing above, and follow them. Some rather elegant research proves this works, and I advise reading it several times...it is a beekeepers treat to imagine.

The final take from Dr. Seeley is how humans can take advantage of the decision making process that occurs when a swarm decides to move. We still have much to learn.



SEPTEMBER – REGIONAL HONEY PRICE REPORT



What's Important When Selling Honey?

This is the fifth year we've looked at what our reporters do to help sell their honey. For reasons only known to the Murphy people, we neglected to put price on the list this year, so that's an non-issue this time. The scoring is self-evident and the numbers represent the percent of our reporters who favor one of the three choices…very, moderately or not important. Note those items that have not changed much over the years, and those that are evolving, to either more or lesser importance. There are interesting trends for some…

The label is interesting. Design seems to be becoming less important, with the name on it not as important, and even local not as important as it has been. We suspect that local, however, will continue to have a draw, so if you are using it, don't stop, and if not, consider it. However, putting the variety of the honey seems to be increasing in importance, so consider that. For the first time we asked about using a second label, like one on top stating variety or local or something …either it's not an issue and isn't used, of folks haven't thought about it yet…still, we recommend using one especially if your honey is sitting on a table and difficult to see. Labels, generally, are the most important vehicle you have for marketing your honey and the more information you can get on them the better. And, rather than simply Wild Flower, consider a good artisanal name, like seasons, places or types of flowers in the name…give it a distinguishing name that customers can remember.

Containers. Glass and plastic remain basically unchanged, but from a consumers perspective, plastic still reigns, but for beekeepers, it's still glass. Ranking…1 lb, qt., 12 oz, pt., 2 lb., and the 5er.

	% Important				% Moderately Important				% Not Important			
	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
My Label Design	87	63	65	55	13	13	32	31	0	25	3	15
Glass Container	49	45	36	33	40	33	41	36	27	23	23	32
Plastic Container	24	23	14	13	49	44	50	45	27	33	26	47
12 oz. Size	34	25	47	44	39	18	21	21	29	57	36	35
1 lb. Size	62	62	59	58	21	28	23	23	17	14	17	20
2 lb. Size	44	38	38	41	20	32	25	22	36	30	37	37
5 lb. Size	44	42	34	36	16	19	28	21	24	39	43	42
Quart Jar	54	50	53	49	12	20	18	23	34	30	29	28
Pint Jar	42	42	49	42	20	26	18	19	23	32	34	39
Price	56	47	62	-	34	47	32	-	10	7	6	-
Local Honey	99	79	84	72	0	15	14	15	1	6	2	14
My Name On Label	80	72	80	72	16	14	13	13	4	15	7	14
Variety On Label	-	23	22	57	-	27	41	34	-	29	37	39
Time of Year	37	18	28	23	36	29	42	41	27	37	30	36
Store I Sell In	55	29	37	39	22	26	30	36	23	21	33	24
Specialty Container	-	-	-	30	-	-	-	15	-	-	-	55
Second Label	-	-	-	9	-	-	-	17	-	-	-	74

	REPORTING REGIONS												SUMMARY		History	
	1	2	3	4	5	6	7	8	9	10	11	12	Range	Avg.	Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS																
55 Gal. Drum, Light	1.67	1.85	1.67	1.50	1.60	1.63	1.71	1.60	1.80	1.75	1.53	1.53	1.50-1.85	1.65	1.65	1.52
55 Gal. Drum, Ambr	1.50	1.65	1.50	1.49	1.50	1.44	1.53	1.50	1.40	1.50	1.53	1.50	1.40-1.65	1.50	1.53	1.40
60# Light (retail)	130.00	126.33	130.00	132.00	120.00	140.00	134.43	130.00	135.59	135.59	146.60	153.33	120.00-153.33	134.49	139.28	131.61
60# Amber (retail)	130.00	116.67	130.00	129.00	120.00	128.75	136.60	130.00	100.00	106.41	138.80	156.48	100.00-156.48	126.89	131.13	123.99
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS																
1/2# 24/case	55.20	71.98	45.60	54.28	66.18	43.25	48.48	66.18	66.18	48.00	49.93	83.15	43.25-83.15	58.20	56.37	53.83
1# 24/case	70.56	82.78	72.00	70.20	76.00	79.18	79.07	86.40	86.90	99.84	79.36	100.27	70.20-100.27	81.88	78.84	80.88
2# 12/case	73.80	75.72	66.60	65.12	69.00	70.09	70.53	76.95	62.00	81.00	65.15	83.08	62.00-83.08	71.59	73.41	66.44
12.oz. Plas. 24/cs	68.16	79.18	50.40	69.71	60.00	66.40	62.17	71.40	71.97	61.20	61.37	72.70	50.40-79.18	66.22	67.59	63.47
5# 6/case	92.22	85.49	78.00	72.13	72.54	75.98	77.48	72.00	72.54	85.20	69.75	97.00	69.75-97.00	79.19	81.21	75.53
Quarts 12/case	128.69	157.44	128.69	115.31	96.00	95.70	107.70	102.00	125.00	120.06	94.73	118.67	94.73-157.44	115.83	102.45	89.83
Pints 12/case	77.50	79.48	77.50	68.40	61.50	57.33	82.75	59.70	96.00	92.40	59.50	70.00	57.33-96.00	73.51	69.39	60.99
RETAIL SHELF PRICES																
1/2#	3.00	3.35	3.00	3.22	4.04	3.53	2.98	2.50	3.09	2.82	3.33	5.33	2.50-5.33	3.35	3.46	3.11
12 oz. Plastic	3.50	4.15	2.59	3.76	3.99	4.07	3.42	3.73	6.90	3.43	4.07	4.66	2.59-6.90	4.02	3.97	3.96
1# Glass/Plastic	3.75	5.10	4.85	4.73	5.15	5.26	4.45	5.14	3.39	4.62	5.35	6.37	3.39-6.37	4.85	5.12	4.83
2# Glass/Plastic	7.50	7.46	8.46	6.94	9.50	8.40	7.27	8.24	7.25	8.27	8.49	10.51	6.94-10.51	8.19	8.27	8.02
Pint	9.08	7.94	9.08	6.77	7.35	6.43	7.79	7.10	12.00	8.56	7.01	9.12	6.43-12.00	8.18	7.81	6.97
Quart	14.71	12.11	14.71	11.05	12.00	10.42	12.12	10.87	18.50	14.29	10.58	15.60	10.42-18.50	13.08	12.08	11.15
5# Glass/Plastic	17.25	16.24	21.97	18.13	24.29	16.50	20.79	16.99	24.29	15.45	18.64	23.48	15.45-24.29	19.50	18.72	18.37
1# Cream	13.66	6.29	6.50	5.74	13.66	5.05	5.46	6.39	13.66	14.25	10.61	6.50	5.05-14.25	8.98	8.04	5.54
1# Cut Comb	6.50	6.09	6.50	6.02	8.01	5.82	6.84	6.00	8.01	8.00	7.15	10.75	5.82-10.75	7.14	6.73	6.73
Ross Round	6.52	5.48	6.50	5.50	6.52	6.50	6.74	6.52	6.52	6.52	7.08	7.13	5.48-7.13	6.46	6.56	6.42
Wholesale Wax (Lt)	2.25	3.75	2.50	3.73	2.15	5.55	3.46	5.00	5.00	6.00	3.25	5.08	2.15-6.00	3.98	3.65	3.46
Wholesale Wax (Dk)	2.25	3.24	2.50	2.66	2.00	5.33	4.61	4.98	5.00	4.98	3.08	4.00	2.00-5.33	3.72	3.13	2.85
Pollination Fee/Col.	90.00	88.75	70.00	45.50	150.00	53.00	54.00	85.73	85.73	85.73	63.33	115.00	45.50-150.00	82.23	80.63	80.93

A Closer Look

SWARMS

Clarence **Collison**
Audrey **Sheridan**

Much has been discovered about how this event transpires, but there's still much to learn.

Swarming – the natural mechanism by which honey bees propagate and distribute themselves – is often first observed in late spring, after warm temperatures and heavy rains have provided plenty of forage for colonies to increase in size in preparation for division. Shortly after the advent of the swarming season beekeepers are hit with a barrage of phone calls from nervous home-owners who have discovered a mass of bees hanging from a tree in their yard. Many times bees will congregate temporarily on tree limbs or under the eaves of homes for a day or two while they search out a suitable nest location. Seeley et al. (2006) reports that an ideal nest site has a volume greater than 20 liters, a hole smaller than 30 square centimeters, perched several feet off the ground and facing south. Occasionally, they will move into a home or building if a suitable natural cavity is not discovered, but the search for a nest site is quite a thorough undertaking, often encompassing several square miles.

The swarm undergoes a threefold decision-making process during nest location. First, potential nest sites must be searched out and their coordinates communicated to other scouts. Second, scout bees must agree on the best location and "vote" for that site. Lastly, there must be a mechanism by which the scouts terminate searching and the swarm initiates movement to the new nest site (Camazine et al. 1999). The decision-making process was partially demystified by German behaviorist Martin Lindauer, who did extensive work with swarm behavior in the mid 1900s, and has been further explained by modern scientists through video analysis, audio recordings and experimentation using artificial swarms.

Honey bee swarms are unique among migrating animals in that only a small subset of bees within the swarm knows where the nest site is located.

"Approximately 5% of bees constituting a swarm have seen the new nest location before the swarm relocates; the remaining 95% apparently have no knowledge of their final destination until they arrive (remember, waggle dancing by nest scouts occurs on the mantle and is directed to other scouts)."

These bees, called 'nest scouts,' are responsible for signaling the swarm to move and guiding them in flight to their destination.

Nest scouts are bees that were nectar foragers prior to swarming (Camazine et al. 1999). They are experienced dancers, and they employ the waggle dance in advertising nest locations to other scouts.

The nest scout dances preceding swarm relocation occur on the surface of the swarm cluster, and are easily observed. According to Seeley and Buhrman (1999), the nest site selection process starts with several hundred scout bees flying from the swarm cluster to search for tree cavities and other potential nest sites. The scouts then return to the cluster, report their findings to other scouts by means of waggle dances, and collectively decide which one of the dozen or so possible nest sites that they have discovered should be the swarm's new home. Once the scouts have completed their deliberations, they stimulate the other members of the swarm to launch into flight, and then steer them in mid-air to the chosen site. Seeley and Buhrman (1999) set up their investigation using artificial swarms comprised of one queen and several thousand individually labeled workers. Swarms were installed on a freestanding vertical platform to which the queen was secured, ensuring that the swarm would not depart during the observation period. A video camera was

set to record the entire surface on which scout dancing occurred, and data was collected for three to four days. The investigators were able to make several inferences about swarm decision-making based on the footage they acquired. On the group level they found that: 1) scout bees locate nest sites up to several miles in all directions from the swarm; 2) scouts advertise a dozen or more sites on the swarm initially, but eventually dance unanimously for one site; 3) the swarm lifts off within an hour of the unanimous decision for one nest location; 4) there is a crescendo of dancing just before lift-off, and 5) the chosen site is not necessarily the one that was first advertised by dancing scouts. Observations made on the individual level showed: 1) dances of individual scouts taper off and eventually cease so that the number of dancers decreases over time; 2) some scouts switch their "vote" from one site to another, and 3) a consensus is generally formed by bees ceasing their dance for a non-preferred site rather than switching to a dance for the preferred site.

Seeley and Buhrman (1999) labeled this decision-making process a "weighted additive strategy," a means of consensus-forming among scouts that prevented a split vote over two or more locations. Years later, the consensus-forming hypothesis was challenged with the "quorum sensing" hypothesis. Seeley and Visscher (2003, 2004) and Seeley et al. (2006), devised a series of experiments to determine which mechanism was

"Honey bee swarms are unique among migrating animals in that only a small subset of bees within the swarm knows where the nest site is located."

actually employed by scout bees. Consensus-forming was defined as an agreement upon a nesting site among dancing scouts who had returned to the swarm; quorum-sensing pertains to the scouts noting when one site is being visited by a certain minimum number of scout bees (a quorum), "voting" for a particular nest location by frequenting that site and reporting it in waggle dances back at the swarm cluster. Individual swarms were given a choice between artificial nest locations equidistant from the swarm (Seeley and Visscher 2003). This experiment investigated how the scouts sense when a group decision has been made and when it is appropriate for them to begin producing the worker piping signals (an acoustic signal produced by scouts) that stimulate their swarm-mates to prepare for the flight to their new home. Simultaneous observations at the swarm cluster and nest sites revealed that worker piping was directly related to the number of scouts at a single nest box, and unified dancing was neither achieved nor necessary for the swarm to relocate. In another experiment, Seeley and Visscher (2004) validated the quorum-sensing hypothesis by comparing the times required for each of four swarms to arrive at a quorum when given a single nest box or five closely-placed equivalent nest boxes in two separate trials. Once again, worker piping was measured to determine when a quorum had been satisfied. Results were clear that the five nest box trial confused scouts, causing them to distribute evenly across the boxes and delaying the onset of worker piping. The same swarms made much more rapid decisions when given a single nest box, and worker piping ensued, on average, about three times faster in single nest box trials. These results strongly indicated quorum-sensing to be the mechanism determining nest-site choice.

The acoustic signal synchronized with quorum sensing, "worker piping," is performed by swarm scouts, and is believed to signal swarm members to increase their body temperature in preparation for lift-off (Seeley and Tautz 2001). Bees performing worker piping do so by mounting an immobile worker bee, and while pressing down with their thorax, they rub their wings together to produce an audible sound which is loaded onto the bee below. This occurs during the last hour before swarm departure, and is apparently the final effort of mantle bees (bees on the outside of the swarm cluster) to mobilize their nestmates. Worker piping is actually one of three defined behaviors which

precede swarm lift-off; the other two are "buzz running" and "shaking." Buzz running describes how a select few bees (presumably scouts returning to the swarm) run about the mantle excitedly, bumping into immobile workers in order to incite them to movement. These hyperactive scouts run in zig-zag patterns, buzzing their wings every second or so, and according to an experiment performed by Martin (1963), only those bees directly contacted by buzz runners join the swarm at departure. Buzz running occurs approximately 10 minutes before take-off and is believed to "loosen up" the swarm in preparation for lift-off. Shaking is a signal directed from one bee to another, which seems to communicate the need for increased activity in quiescent bees. During this behavior the active bee grasps the inactive bee from above and shakes her body for one to two seconds at 16-18 Hz (Hertz (Hz) is a unit of frequency defined as the number of cycles per second of a periodic phenomenon). Shaking occurs long before lift-off, so it is not believed to be the warm-up signal. There is much evidence; however, that worker piping elicits swarm-warming (individual bees increasing body temperature in preparation to fly).

Seeley and Tautz (2001) showed that the time-course of worker piping matched that of swarm warming. They constructed a two-swarm mount that enabled the observation of two manipulations of artificial swarms, simultaneously. One side of the mount was designed to allow pipers to contact the swarm cluster; the other excluded pipers via a wire mesh screen so the piping signal could be evaluated separately from swarm-warming. Worker piping was recorded using two small microphones placed at the center of each swarm, and swarm core temperature was measured via a thermocouple probe placed in the center of each cluster. A video recorder was set before the swarm stand to provide visual data on the behavior of mantle bees and to identify the pipers. Both worker piping frequency and swarm core temperature rose to their maximum levels just before take-off, and there was a strong correlation between the rates of piping and warming. The swarm treatment that excluded contact from pipers resulted in the swarm failing to warm to flight temperature (35°C, 95°F).

Once a nest site has been chosen and the swarm properly warmed for flight, the nest scouts must lead the swarm to their new home. Approximately 5% of bees constituting a swarm have seen the new nest location before the swarm relocates; the remaining 95% apparently have no knowledge of their final destination until they arrive (remember, waggle dancing by nest scouts occurs on the mantle and is directed to other scouts). How is it that such a small number of scout bees are able to guide the entire body of the swarm over distances that can amount to several miles? Two hypotheses could explain this swarm guiding phenomenon: 1) a few 'streaker' bees fly rapidly through the airborne swarm in the correct direction of travel (arbitrary observations reported by M. Lindauer), or 2) scout bees provide a pheromone trail, elicited from their Nasanov gland, which creates an odor gradient that the swarm can follow. Both hypotheses were tested by Beekman et al. (2006) by comparing the flight times of normal swarms and those in which each bee's Nasanov gland was sealed shut. The flight times of normal and altered swarms to a predetermined nest location were almost identical, even when swarm size varied greatly, so the hypothesis of olfactory guidance was nullified. Photographic documentation of swarms in flight revealed that a few individuals within the swarm were flying exceedingly fast in the direction of the nest-site, which supports the hypothesis of visual guidance. Furthermore, Janson et al. (2005) was able to develop a mathematical model simulating the movement of a swarm guided by a maximum of 5% of its constituent bees. The model showed that a small number of streaking bees would be able to correct deviations in the swarm's flight pattern, even as the shape and velocity of the swarm cloud changed.

Clearly, the process of swarm relocation is an intricately mechanized one, requiring much cooperation and trust on the part of the uninformed swarm cluster, and timeliness on the part of the nest scouts. How nest scouts are chosen remains a mystery, and the importance of queen pheromone to the swarm is not entirely evident, since swarms will lift-off without their queen. Also, what effect, if any, does the availability of good forage in the immediate area have on nest-site selection? There is still much to be learned about swarm behavior! BC

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Sheridan/Collison Continued (6)

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RESEARCH REVIEWED

The Latest In Honey Bee Research

Steve **Sheppard**

"Honey Bees of Borneo – exploring the center of Apis diversity."

In recent months, a number of Research Reviewed columns have chronicled the status of our beloved western honey bee, *Apis mellifera*, in reference to research on Colony Collapse Disorder and the continuing challenges faced by beekeepers striving to maintain healthy colonies of bees. These issues continue and no doubt we will return in future columns to chart research progress toward regaining apicultural stability. However, this month I'd like to bring your attention to a major contribution toward a comparative understanding of the biology of honey bees and frankly, to introduce you to a really beautiful book with an unusual title, Honey Bees of Borneo (Koeniger et al. 2010).

The subtitle of the book "Exploring the centre of Apis diversity" provides the foundational reason for why this work tells a story that is likely to be fascinating for all readers who harbor curiosity about honey bees. Two of the authors, Drs. Nikolaus and Gudrun Koeniger, have spent much of their careers researching the mating behavior and reproductive systems of honey bees, from early work on drone congregation areas in Austria to their later research synthesizing comparative reproductive biology of honey bee species within the genus *Apis*. Their co-author, Salem Tingek, has the great good fortune to live in a part of the world where five different species of honey bees in the genus Apis are found nearby for his research collaborations with the Koenigers. To put that in perspective, our western honey bee species is the sole representative of the genus *Apis* occurring in Europe, Africa, parts of western Asia and more recently (thanks to human assistance) in new haunts in the Americas and Australia. The introduction of *Apis florea* into some parts of East Africa and of *Apis cerana* in Australia actually changes that simplistic story – but we will leave these introductions for another column.

Despite the title, the authors present an up to date and comprehensive discussion of the biology of various honey bee species, including those species that do not occur in Borneo. Of special interest are sections on fossil ancestors and the phylogenetic relationships among the species. Among the nine recognized species of honey bees, there are a number that nest inside cavities (ala *Apis mellifera* and *Apis cerana*) and a number that nest on a single comb, often in rather "exposed" locations. These latter include both the "giant" and "dwarf" honey bees, such as *Apis dorsata* and *Apis florea*, respectively. The authors present a very cogent argument for the somewhat controversial view that cavity-nesting is the ancestral condition in honey bees, with nesting in exposed single combs being the more recent "derived" condition. They base this conclusion, in part, on the observation that the cavity-nesting species are all of similar size, while the giant and dwarf bees represent size variations that allow them to either hide from predators more easily (dwarf species) or to have an enhanced defensive stinger to deal with predators (giant species). While arguments can be made for both sides of the controversy, the authors point out that their explanation requires fewer evolutionary "steps" to explain the distribution of nesting habits. Therefore, on the basis of "Occam's razor" (preference for the simpler of competing explanations), ancestral cavity-nesting should be considered more likely, until additional evidence suggests otherwise.

Subsequent chapters cover mating systems and reproduction for the different species, communication for food and the dance language, food resources and colony defense. In the latter chapter, the authors describe several noteworthy predators and parasites of bees in Borneo, including birds (the Blue-throated bee-eater and Oriental honey buzzard), insects (ants, the Death's-head moth and a parasitoid fly) and *Varroa* and *Tropilaelaps* mites.

Addressing the human side, the authors include chapters on traditional honey-gathering in Borneo, on *Apis dorsata* beekeeping in the swamps of West Kalimantan, on beekeeping with *Apis cerana* in Borneo and on efforts to introduce the western honey bee into Borneo. In the final chapter the authors describe the need to revise international honey standards to afford appropriate commercial value for the diverse honeys produced by other *Apis* species. They note that the application of standards for honey from *Apis mellifera* to the honey produced by indigenous bees from Borneo is inappropriate and actually detrimental to the use and conservation of these exquisite animals.

In addition to the information content mentioned above and a surprisingly humorous writing style that makes the book a pleasure to read, perhaps the single most spectacular aspect of the book are the truly

remarkable photographs. The book showcases many dozens of excellent photographs of the bees, of their nests and habitat situations and of some of the research methods used by the authors in their research in Borneo throughout the years. For instance, a series of photographs documenting the use of archery equipment and climbing gear to reach *Apis dorsata* nests high in the trees show the level of ingenuity required to work on bees in the deep forests. Overall, this work is one that will be of enduring interest to beekeepers and other students of biology who want to learn more about the remarkable diversity of honey bees. The authors eloquently provide the reader with a "big picture" evolutionary framework for honey bees that, in turn, can lead to a fuller appreciation of the western honey bee and its place within the biological setting of the genus *Apis*. BC

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Managed Pollinator CAP
Coordinated Agricultural Project

Honey Bee Nutrition

Zachary **Huang**

INTRODUCTION

Honey bees, like any other animal, require essential ingredients for survival and reproduction. What we know about honey bee nutrition now was learned mostly during the 50s-70s, and recent studies specifically on honey bee nutrition are very few. Honey bees require carbohydrates (sugars in nectar or honey), amino acids (protein from pollen), lipids (fatty acids, sterols), vitamins, minerals (salts), and water. Additionally, these nutrients must be present in the right ratio for honey bees to survive and thrive.

Carbohydrates

Like other animals, honey bees need carbohydrates as an energy source. All carbohydrates are first converted to glucose, which enters the Krebs cycle and produces ATP, the fuel in nearly all cells, and carbon dioxide and water as by-products. Aside from being used as an energy source, glucose can also be converted to body fats and stored. A worker bee needs 11 mg of dry sugar each day (Huang et al., 1998). This translates to about 22 ul of 50% sugar syrup per worker per day. A colony with 50,000 bees therefore needs 1.1 liter (about two pounds) of 50% sugar syrup per day (about half a gallon of nectar at 25% sugar concentration), which does not include brood rearing and other activities. A colony of this size, therefore will consume almost 700 pounds of nectar per year, assuming the nectars having a 50% sugar concentration. Of course, consumption is lower during Winter when temperature is not regulated at 35°C, but perhaps that cancels out the brood rearing and flight activities.

Collection of Nectar

Nectar is the main source of carbohydrates in the natural diet of honey bees. Sugar concentration in nectar can vary widely, from 5% to 75%, although most nectars are in the range of 25% to 40%. A honey bee uses her proboscis to suck up nectar from flowers and stores the liquid in her honey crop. The crop is a specialized part of the digestive system, and has a structure between it and the midgut, where digestion takes place. This structure, the proventriculus, can let some nectar in when the forager needs energy on its way home, remove pollen inside the nectar, and serve as a one-way valve to prevent backflow from the midgut. This ensures that no contamination of nectar or honey can take place. For this reason I tell people that honey is definitely not "bee vomit." The honey crop is also the site of synthesis of ethyl oleate, a pheromone from foragers that tells young bees that they do not need to develop into foragers. The average weight of the nectar inside the crop is 25.5±15 mg (Calderone and Page, 1992), quite a feat considering that an average worker bee weighs 120 mg.

Conversion of Nectar into Honey

Foragers add enzymes (invertase, glucose oxidase) to nectar during foraging, so some digestion is already occurring before nectar is brought back to the hive. Invertase converts sucrose into two six-carbon sugars, glucose and fructose. A small amount of the glucose is attacked by the second enzyme, glucose oxidase, and gets converted into gluconic acid and hydrogen peroxide. Gluconic acid makes honey acidic, and hydrogen peroxide has germ-killing properties, both contributing to honey's unfriendly disposition to bacteria, mold, and fungi. Foragers then pass the nectar to special "receiver" bees, which are middle-aged bees that have finished nursing, but have not started foraging yet. Receiver bees deposit nectar into cells and dry the nectar either on their mouthparts, by forming a large drop between the proboscis and the mandibles, or by fanning over the cells. The moisture has to be reduced to 17%-18% before bees consider the honey "ripe" and then seal the cells. Honey with high glucose levels (such as canola honey), will crystallize very quickly and should be extracted as soon as possible.

Toxic Substances in Nectar and Sugar Supplement

Adult bees can utilize glucose, fructose, sucrose, trehalose, maltose, and melezitose, but bees are unable to digest rhaminose, xylose, arabinose, galactose, mannose, lactose, raffinose, melibiose or stachyose. Most of these sugars are also toxic to honey bees. About 40% of sugars found in soybeans are toxic to bees, and therefore care should be taken when using soybeans as a pollen substitute.

Other plants are toxic to bees due to the presence of alkanoids in nectar. These include: azalea *(Rhododendron molle)*, azure *(Aconitum carmichaeli)*, black hellebore (*Veratrum nigrum*), California buckeye *(Aesculus californica)*, Chinese alangium *(Alangium*

chinense), Chinese bittersweet (*Celastrus angulatus*), jimson weed *(Datura stramonium),* plume poppy (*Macleaya cordata*), happy tree (*Camptotheca acuminate*), Summer Titi (*Cyrilla racemiflora*), tea (*Camella sinensis*) and oil-tea (*C. olelfera*). Nectar from these plants is usually toxic to both adult bees and brood, and the majority of them are also toxic to humans.

Honey dews are sugary secretions produced by homopteran insects (aphids, leafhoppers, and woolly aphids). Honey dews are produced because the low protein diet (plant sap) that these insects rely on force them to drink excess fluids to obtain enough amino acids, and thus need to secrete the excess sugary water. Honey bees will collect honey dews to make honey dew honey. This type of honey is praised by some people due to its strong and unique flavor, but can cause dysentery in overwintering bees due to indigestible sugars or high levels of minerals. Adult bee paralysis in bees in Germany was also attributed to high Potassium and/or Phosphorus and low Sodium concentrations.

HMF (hydroxymethylfurfural) is formed in honey and high fructose corn syrup (HFCS) at high temperatures due to acid-catalyzed dehydration of hexose sugars, with fructose more prone to its formation. HMF above 30 ppm (parts per million) is considered toxic to honey bees. HFCS with such levels of HMF has been found to cause high mortality in cage studies (LeBlanc et al., 2010), as well as higher mortality than bees infected with *Nosema ceranae* (Z.Y. Huang, unpublished data). Beekeepers using HFCS for bee feeding should pay special attention to storage conditions, although many times, the batch from the supplier might have already become "bad" due to high temperatures either during transportation or storage.

Some honeys are not toxic to bees, but to humans. A good example is honey from tutu *(Coriaria arborea)*, which has caused fatalities in New Zealand.

Protein

Importance of Pollen

Pollen provides bees with protein, minerals, lipids, and vitamins (Herbert and Shimanuki, 1978). All animals need essential amino acids, which must be obtained externally and cannot be synthesized by animals. Honey bees also need the same 10 amino acids as other animals (e.g., humans). These amino acids are obtained from pollen only, because honey bees do not have any other sources of protein. Pollen collection by a colony ranges from 10-26 kg (22-57 pounds) per year (Wille et al., 1985). When honey bees are provided with insufficient pollen, or pollen with low nutritional value, brood rearing decreases (Turner et al., 1973; Kleinschmidt and Kondos, 1976, 1977) and workers live shorter lives (Knox et al., 1971). These effects ultimately affect colony productivity (reviewed by Keller et al., 2005). Shortages of pollen during rainy seasons can cause colony decline or collapse (Neupane and Thapa, 2005). Recent studies have shown that spring pollen supplement can work as insurance (when Spring weather is bad) for faster Spring buildup and higher honey yield (Mattila and Otis, 2006a), and can reduce the effects of *Varroa* parasitism (Janmaat and Winston, 2000) and nosema infection (Mattila and Otis, 2006b).

Collection of Pollen

Pollen is collected either by pollen foragers, which specialize on pollen collection, or nectar-foragers, which happen to be dusted with pollen. Pollen is brushed off the worker's body by the front and middle legs, and transferred to a special structure in the hind leg called the cubicula, or pollen basket. Pollen foragers unload their pollen by "kicking" the pollen pellets off their legs into a cell, which often already has pollen in it, and then the pollen pellets are "hammered" into a paste-like consistency by other workers. Due to the secretions added by bees, the pollens in each cell go through a lactic fermentation. The main effects of fermentation seem to be the reduction of starch (from 2% to 0%), increases in both reducing sugars and fiber, and reduction of ash and pH (Herbert and Shimanuki, 1978). Three bacteria that might contribute to lactic acid fermentation are found in bee bread: Pseudomonas, Lactobacillus, and Saccharomyces. Recently, it is shown that pollen collected by bees can easily be inoculated and fermented, and bees consumed it in the same way they consume unfermented pollen (Ellis and Hayes, 2009).

The weight of two pollen pellets from a pollen forager ranges from 7.7-8.6 mg (Rose et al., 2007). A colony will collect more pollen if it has more brood pheromone, more queen pheromone, or is genetically disposed to collect more pollen. Robert Page (currently at Arizona State University) has selected high and low pollen hoarding lines, whereby the high pollen line will collect so much pollen that there is no room to rear brood, and the low pollen line will perish without supplementing pollen artificially.

Processing Pollen into Proteins

Pollen is mixed with glandular secretions to produce "bee bread," which is consumed by young bees, considered the "social stomach" for protein digestion (because foragers cannot digest pollen directly, but still need protein (Moritz and Creilsheim, 1987). Rearing one larva requires 25-37.5 mg protein, equivalent to 125-187.5 mg pollen (Hrassnigg and Crailsheim, 2005).

Newly emerged bees have undeveloped hypopharyngeal and mandibular glands. Hypopharyngeal glands are paired glands inside worker's head, consisting of a long central duct with many "grapes" (acini) attached. The glands will only develop

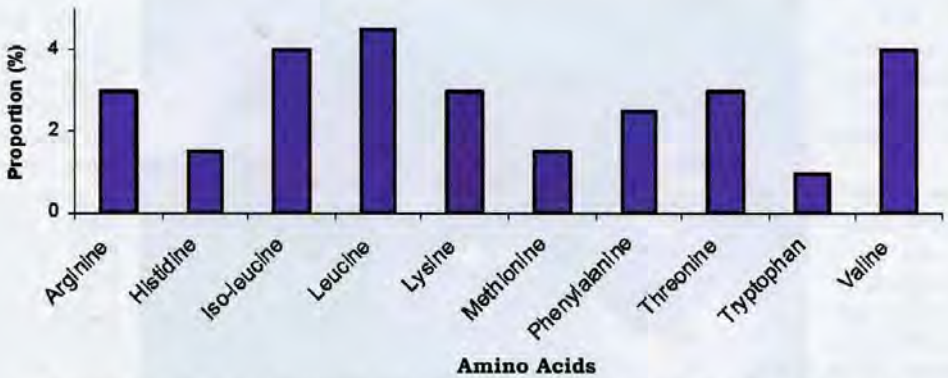
after consuming a lot of pollen for the first 7-10 days. The glands first secrete the protein-rich component of royal jelly in young bees, but then secrete invertase, which is used to convert sucrose to simple sugars (fructose and glucose), in foragers. Mandibular glands are simple, sac-like structures attached to the base of each mandible. The glands secrete lipid-rich components of the royal jelly in young bees, but produce an alarm pheromone (2-heptanone) in foragers.

Royal Jelly Composition

Royal jelly (RJ) is 67% water and 32% dry matter. The dry matter is composed of 12.1% carbohydrates, 4.0% lipids, 12.9% proteins, and 1.1% ash (Wangchai and Ratanavalacai, 2002). These percentages vary slightly in different seasons. RJ also contains many trace minerals, some enzymes, antibacterial and antibiotic components, and trace amounts of vitamin C. The fat-soluble vitamins, A, D, E and K, are absent from royal jelly. The 13% of total proteins consists of 52 different proteins (Yu et al., 2009). The majority of the identified proteins (47 out of 52) are major royal jelly proteins (MRJPs), named as MRJP1 through 6, each of which has many variations. Three enzymes were also detected in the RJ: glucose oxidase, peroxiredoxin, and glutathione *S*-transferase.

It is no doubt that RJ is highly nutritious for bee larvae. Bee larvae grow exponentially during their first 4.5 days of life, from 0.36 ± 0.008 mg (12 hr larvae) to 131.44±18.7 mg (4.5 days), reaching a weight of 159.66±12.91 mg after being capped (Petz et al., 2004). The weight gain is nearly 1000 times when compared to the weight of the eggs (0.17 mg, Taber et al., 1963). Furthermore, bee larvae do not defecate at all during the first five days of life, which is necessary because otherwise larvae would be feeding on their own waste. The midgut and hindgut are not connected until the last molt into the mature larvae, therefore preventing the possibility of defecation. After defecation, the larva stops feeding, starts spinning a cocoon, and straightens itself along the cell axis, and becomes a prepupae. Three days later it will pupate and eventually, (after one week) emerge as an adult.

It is not yet clear what role(s) the major royal jelly proteins play in honey bee larvae nutrition. Larvae can survive on an artificial medium without RJ or proteins for three to four days, but they all die one to two days before defecation (Z.Y. Huang, unpublished results). Until a chemically defined media is available for honey bee larvae, we will not know the roles various components of RJ play in larval growth and development.



Proportion (%) of the 10 essential amino acids needed by honey bees (deGroot, 1953).

Measurements of Pollen Quality

Pollen quality can be measured by two methods: crude protein levels or the composition of amino acids. Ten amino acids have been found to be "essential" for honey bees (deGroot, 1953), meaning that bees cannot synthesize or even convert other amino acids to acquire them, and therefore must obtain them directly from food, either as free amino acids or digested from protein. These 10 amino acids are listed on the chart above. The crude protein level tells us how much protein a particular plant pollen has, and higher crude protein levels are better than lower ones. However, if the 10 amino acids are not balanced, bees cannot fully use what is available in the pollen. For example, the chart shows that honey bees need 4% isoleucine from the total available amino acids, if one type of pollen has only 2% isoleucine, then bees can only use 50% of the total protein because isoleucine will be the limiting factor (Stace, 1996), forcing bees to ingest twice the amount of total pollen to obtain the needed isoleucine, essentially wasting half of the total protein.

Not All Pollens Are Created Equal

Different pollens have different nutritional value to honey bees. Schmidt et al. (1987) studied the nutritional value of 25 pure pollens by feeding caged bees the different pollens, using sugar as a negative control, and mixed pollen as a positive control. Consumption of test pollen diets varied dramatically among test pollens, with a mean consumption of 16.5 mg pollen per bee for the first 10 days and a range of 1.9-29.0 mg per bee. Both pollen consumption rates and crude protein levels are correlated with the ability to improve longevity. Pollens that decreased worker longevity include ragweed (*Ambrosia*), a rust spore (*Uromyces*), cattail (*Typha*), and Mexican poppy (*Kallstroemia*). Those that slightly improved worker longevity include terpentine bush (*Haplopappus*), desert broom (*Baccharis*), and dandelion (*Taraxacum*). The best pollens are those from Mormon tea (*Ephedra*), mesquite (*Prosopis*), blackberry (*Rubus*), and cottonwood (*Populus*) Mixed pollen consistently performed very well. In another study, Schmidt et al. (1995) concluded that bees foraging in sesame and sunflower fields should be supplemented with other pollen, but rapeseed (canola) pollen is highly nutritious to bees and does not need supplementing. Through these studies, Schmidt concluded that factors contributing to increased bee longevity include presence of attractants and phagostimulants, so that bees will readily consume

large amounts of pollen; lack of toxic compounds; and a good nutrient balance or level. No studies have tried to correlate the amino acid profile of a pollen and its ability to improve worker longevity.

A few pollens are toxic to honey bees, with some killing the adults (e.g., *Zigadenus*), others killing the brood (e.g., *Heliconia*). Other plants with toxic pollen are balsa (*Ochroma lagopus*), California buckeye (*Aesculus californica*), and Flame of the Forest (*Spathodea campanulata*).

Pollen Substitute for Bees

A good pollen substitute for honey bees should have the same features as a good pollen: 1). palatability (bees will readily consume it), 2). Digestibility (it is easily digested by bees), and 3). Balance (it has the correct amino acid balance and enough crude proteins). Currently there are four commercial pollen substitutes for honey bees in the U.S.: Bee-Pol®, Bee-Pro®, Feed-Bee®, and MegaBee®. It appears that Bee-Pro® is soy-based, and Feed-Bee® and MegaBee are non-soy-based. I have insufficient information for Bee-Pol.

Cremonez et al. (1998) fed caged bees various diets and used hemolymph protein titer to assess their quality, with higher protein titer suggesting higher quality. Six day old bees had protein concentration of 27.6, 24.1, 11.4, 3.98, and 2.2 ug/ul, for bee bread, soybean/yeast, pollen, corn meal and sucrose, respectively. De Jong et al. (2009) used the same assay to assess the quality of commercial pollen substitutes. They found that bees feeding on Feed-Bee®, Bee-Pro®, pollen, acacia pod flour diets and sucrose had hemolymph titers of 9.42, 8.95, 6.26, 6.0 and 3.56 ug/ul, respectively. It would be informative to see if the high protein in blood translates to longer life in either cages or small colonies.

Gregory (2006) reported that for longevity inside small colonies of bees fed different diets, ranked by superiority: fresh pollen > Feed-Bee® > Bee-Pro® > old pollen. In cage studies, Feed-Bee® had similar hemolymph protein to fresh pollen. She also reported that Feed-Bee® contained 34.9 mg sucrose and 2.03 mg stachyose, while Bee-Pro® contained 8.85 mg sucrose and 4.55 mg stachyose. Stachyose is toxic to honey bees unless it is diluted to below 4% with 50% sucrose.

Degrandi-Hoffman et al. (2008) evaluated three diets, Bee-Pro®, Feed-Bee®, and MegaBee®, in two separate trials. In both trials, Bee-Pro® and MegaBee® patties were consumed at rates similar to pollen cake, but Feed-Bee® was consumed significantly less. Higher food consumption was significantly correlated with increase in brood area and adult population size. According to this study, MegaBee appeared to be superior to both Bee-Pro® and Feed-Bee® in terms of brood production or adult population.

Honey bee collected pollen is the only usable diet for rearing bumble bee colonies in commercial settings.

Pollen Nutrition May Play a Role in CCD

Recently, a new threat, Colony Collapse Disorder (CCD), emerged to attack the honey bees in the U.S. and has contributed to a 30%-40% loss of bee colonies each Winter since the Fall of 2006 (CCD working group, 2007). CCD-affected colonies have greatly reduced adult bee populations, with only a few hundred workers and the queen left, but with many frames of brood, which suggests rapid depopulation of adults. The cause of CCD remains unknown, but many scientists believe that it may be caused by a combination of factors, such as pesticides, parasites, nutritional stress, and stress from long distance transportation. There is a growing body of evidence showing that poor nutrition can be a major player in affecting honey bee health. Eischen and Graham (2008) demonstrated that well-nourished honey bees are less susceptible to *Nosema ceranae* than poorly nourished bees. Honey bees that were treated with imidacloprid and fed *Nosema* spp. spores suffered reduced longevity and reduced glucose oxidase activity, indicating an interaction between the two factors (Alaux et al., 2010a). Naug (2009) tested the hypothesis that nutritional stress due to habitat loss has played a major role in causing CCD by analyzing the land use data in U.S. He showed a significant correlation between the number of colony losses due to CCD from each state and the state's ratio of open land relative to its developed land area. Furthermore, Naug showed that these states with the largest areas of open land have significantly higher honey production. It therefore appears that honey plants (especially those in natural, undeveloped areas) might play a major role in honey bee health.

Polyfloral Diets Healthier for Honey Bees

Schmidt conducted a series of studies and convincingly showed that in general, mixed pollen given to caged bees let bees live longer than those on a single species of pollen (Schmidt, 1984; Schmidt et al., 1987, 1995). In a very recent study, Alaux et al. (2010b) showed that polyfloral diets from mixed pollen enhanced some immune functions compared with monofloral diets, in particular glucose oxidase activity, suggesting that the diversity in floral resources provided bees with better in-hive antiseptic protection. These studies suggest that bees feeding on a single type of pollen are not as healthy as those on a variety of pollens. With the modern way of agriculture – increasingly larger areas of mono-cultured crops – honey bee health might be adversely affected.

Other Nutrition Sterols and Lipids

A sterol, 24-methylene cholesterol, is common in pollen and is the major sterol source for honey bees. Nearly all insects need to obtain sterol from their diet because of their

inability to synthesize them directly. Sterol is the precursor for important hormones such as molting hormone, which regulates growth because it is required at the time of each molt. It is not clear what other lipids are required by honey bees, but most likely normal consumption of pollen provides for all the lipid requirements. Pollen with low fat content is less likely to be consumed by honey bees, but can be made more attractive to bees with the addition of lipids. The total lipid concentration within a pollen supplement is recommended to be 5%-8%.

Vitamins

Nurse bees are thought to need the following vitamin B complex for brood rearing: thiamine, riboflavin, nicotinamide, pyridoxine, pantothenic acid, folic acid, and biotin. Ascorbic acid (vitamin C) also seems essential for brood rearing. Like sterol and lipids, the vitamin needs of a honey bee colony are satisfied if pollen stores are abundant in the hive or fresh pollen is being brought into the colony. It is not known whether micro-organisms naturally present in the alimentary canal of bees may play a role in providing vitamins and other essential substances.

Minerals

The mineral requirements of honey bees are poorly understood. High amounts of potassium, phosphate, and magnesium are required by all other insects, and so presumably are by honey bees as well. Excessive levels of sodium, sodium chloride, and calcium have been shown to be toxic to honey bees. Again, all the required minerals can be obtained from pollen, although nectar also contains minerals. Dark honey contains higher levels of minerals. The optimal ash concentration for maximum brood rearing seems to be at 0.5%–1%. Pollen with more than 2% ash inhibits brood production.

Water

Honey bees forage for water for two purposes. One is to use it to dilute honey so that honey can be added to brood food. The second is to use water to cause evaporative cooling by fanning over a thin layer of water when the ambient temperature is over 35°C. During Winter time, bees have enough water from condensation over the inner cover, so the issue is usually too much water, which can drip on the cluster and kill bees if there is not adequate ventilation. When bees have a choice, they usually prefer water with some salts (e.g. a swimming pool over a lake). Other species of honey bees (e.g. *Apis dorsata, A. cerana*) have been observed to forage on urinals or open restrooms in Asia. This is probably because bees are not obtaining adequate sodium from their nectar or pollen.

CONCLUSIONS

Honey bees can obtain all of their nutrients naturally if bees are in a natural setting. Unfortunately, modern agriculture has necessitated large scale mono-cropping which can be harmful to honey bees. This is mainly because each plant species has a specific nectar or pollen characteristic. Much like humans, a lack of variety in foods can cause problems. Many studies have shown poly-floral pollen diets are superior to a single species of pollen, with perhaps one exception (rape seed pollen alone can be excellent). We urgently need to understand the implication of each mono-culture crop on honey bees. For example, how much stress do bees experience when feeding exclusively on almond nectar and pollen for three to four weeks? How long do they need to (or can they?) recover after the stressful period? Are there "supplemental" crops available to reduce or eliminate such a stress? By understanding these questions and providing solutions to them, we will be able to make bees as healthy as possible. BC

ACKNOWLEDGEMENT

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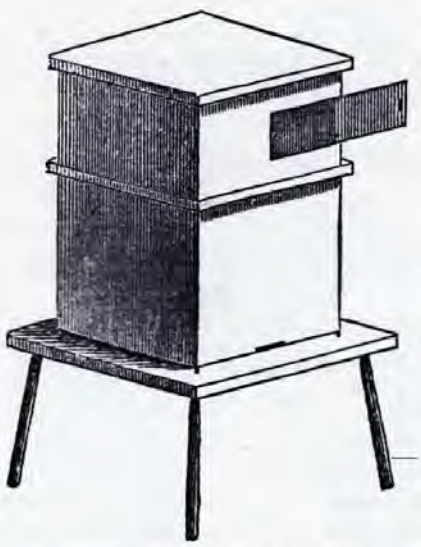
LANGSTROTH'S INSPIRATIONS

Each of these hive designs contributed to Langstroth's Solution!

Gene **Kritsky**

Lorenzo L. Langstroth, credited for developing the first true moveable frame hive, worked with several kinds of hives before his "eureka" moment, and these hives played a critical role in his hive design. Langstroth's passion began with a jar of honey, as he described in a series of essays in *Gleanings in Bee Culture*: "In the summer of 1838 the sight of a large glass globe, on the parlor-table of a friend filled with beautiful honey in the comb, led me to visit his bees, kept in an attic chamber; and in a moment the enthusiasm of my boyish days seemed, like a pent-up fire, to burst out into full flame. Before I went home I bought two stocks of bees in common box hives, and thus my apiarian career began (Langstroth 1893)."

The common box hive in use in the 1830s, also called the simple box hive, was not an elaborate construction. As the name would suggest, these hives were plain wooden boxes within which the bees would build their comb. To help the bees along, the boxes were often furnished with crisscrossed sticks to provide purchase for the bees and to guide the start of their comb production. Placing sticks within the hive was also a common practice for straw skep beekeepers, who would use dowels to skewer pieces of comb inside the hive to give the bees an idea of where to start building (Kritsky 2010).



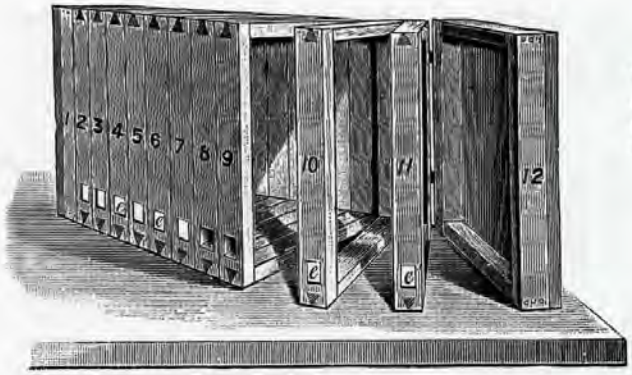
The common hive box used in the United States during the 1830s. (Minor 1857)

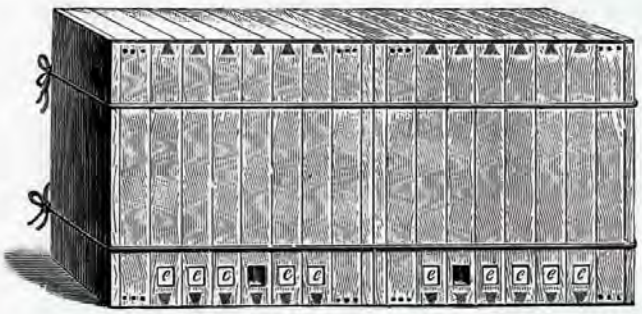
Shortly after Langstroth moved to Greenfield, he purchased a simple log hive (Langstroth 1893). Log hives, also called bee gums, were hollowed logs with an entrance hole carved into one side and a board placed over the open top to serve as a simple cover. Bees took naturally to these logs in much the same way they took to cavities in trees in the forests. The beekeeper could get to the honey by simply removing the top and cutting away the comb within (Kritsky 2010).

Langstroth (1893) does not describe how his use of these first hives influenced his enjoyment of keeping bees. He wrote, "I learned, by diligent inquiries of the best beekeepers in my vicinity, all that they could teach. But this was not much, as none of them knew enough to drive bees out of their hives, nor used smoke to facilitate their operations, so that I was indeed groping almost in the dark." It seems likely that the messy removal of the comb and the destruction of the bees that may have been employed to work these simple boxes and log hives would have triggered Langstroth's creative desire to explore more easily managed beehives.

Langstroth (1893) continued, "About this time I was fortunate enough to get two valuable works – the "Letters" of the immortal Huber, and the second edition of Bevan's Treatise on the Honey-bee, London, 1838." These works provided Langstroth with critical information on bees and influenced his decision regarding what kind of hives he should start using. He wrote, "I soon became the happy owner of an improved Huber hive, and several bar-hives, all made according to Bevan's directions."

Langstroth does not detail which version of François Huber's book (*Nouvelles Observations sur les Abeilles*) he obtained, but Naile's (1976) list of books in Langstroth's library indicated that he had a copy of the 1814 edition. In the 13th "letter," Huber detailed his book hive or leaf hive (Huber 1926). For Huber, the leaf hive's advantage was the "promotion of the economical science of bees." The leaf hive frames were one square foot in size and "15 French lines" or approximately 1-13/32" wide, according to Cheshire (1888). The frames were hinged on one side, which facilitated the opening of the frames like the pages of a book. To guide the bees' comb construction, Huber would fix a piece of comb on the underside of the top bar of the frame, holding it in place with pegs and a lath. All of the hinged frames could then be closed and tied together to give the hive the appearance of a box. Although Huber did not illustrate his hive with any kind of cover, Bevan (1843) did show a Huber leaf hive with a gabled cover that would keep the rain from seeping in between the frames, unless the hive were kept within a bee house. Entrances were formed at the bottom of the frames





The Huber leaf hive, open (top) and closed (bottom). (Cheshire 1888)

opposite the sides with the hinges. A divider could be incorporated to form a long hive that could accommodate two isolated colonies. Langstroth (1893) found the leaf hive limiting and used the Huber hive "merely for the purposes of observation." However, the use of a quadrilateral frame did eventually figure into Lanstroth's final hive design.

Unlike Huber's book, Bevan's book seemed to have a greater impact on Langstroth's thinking. Bevan (1843) described several hives, ranging from his own bar hive to horizontal pottery hives, simple straw skeps, and Huber's leaf hive. He also compared the advantages of wooden boxes to straw skeps and concluded that wooden boxes were superior. This comparative approach, discussing small details in hive design, likely fueled Langstroth's creativity, and he set up "quite a city apiary" using Bevan Bar hives.

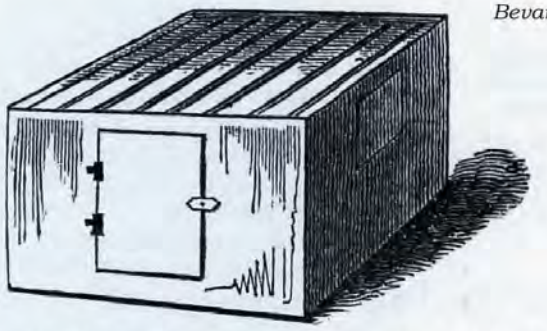
Bevan's bar hives included a number of features that would eventually influence Langstroth's hive design. Bevan (1843) wrote, "The sides of the boxes should be an inch thick, and have the upper edges of the fronts and backs rabbeted out half their thickness and half an inch deep to receive a set of loose bars upon their tops, which should be half an inch thick, and one-eighth of an inch wide, and seven in number. If the distances of the bars from each other be nicely adjusted, there will be interspaces between them of about half an inch. The precise width of the bars should be particularly attended to, and also their distance from each other; as any deviation in this aspect would throw the combs wrong, particularly if that deviation gave an excess of room." Bevan specified that the center bars should be 7/16 of an inch apart; however, he gradually increased this space to 9/16 of an inch on the bars at the sides of the hive. Clearly, Bevan did not understand the concept of the bee space.

As he used the Bevan bar hive, Langstroth (1893) ran into problems. He wrote, "In the Bevan hive . . . the combs were attached to bars or slats which rested upon rabbets just deep enough to receive them. The cover fitting closely upon the top surface of these bars, was, of course, very firmly propolized to them. To remove it and get at the bars, Key's metallic plates were used; but even with them it was often difficult to perform the manipulation needed." Langstroth realized that dealing with the propolized cover would also alleviate another problem. He continued, "As the cover rested on the bars, the bees could get into the supers placed upon it, only by passing between crowded ranges of combs; and the opening admitting them into these supers had to be made with special reference to this fact. My chief improvement upon [Bevan's] hive was to deepen the grooves upon which the bars rested, so as to allow about three-eights of an inch [italics mine] between the cover and the bars. This not only facilitated very much removing and replacing of the cover on which the surplus honey-receptacles rested, but gave a shallow chamber from which heat and odor of the hive could ascend freely into the supers, besides admitting the bees to them in the easiest possible manner." The deepening of the grooves to permit the bars to be separated from the cover by 3/8" (which would later be known as the bee space) was Langstroth's first use of this dimension in a hive design.

Langstroth continued to modify Bevan's design. He wrote, "This improved hive had also a bottom-board of my own invention which could be opened or shut, even in the most crowded stocks, without crushing a single bee, and which, as the hive stood upon legs, permitted attachments of the combs to the front and rear walls of the hive to be severed from below as well as from above. Some of these hives were about 18 inches long by 18 inches wide and six deep, thus giving an unusual storage room for surplus-honey receptacles placed above the main hive."

Huber's leaf hive demonstrated to Langstroth the functionality of using a frame to keep the comb more secure and easier to handle. The Bevan bar hive demonstrated the ease of simply lifting out a sheet of comb, rather than having to cut the combs from the hive. But Bevan's failure to

Huber's leaf hive fitted with a gabled cover. (Bevan 1843)



Bevan's bar hive. (Bevan 1843)

deal with the bees' tendency to seal up the cover with propolis provided Langstroth an easier opportunity to experiment with spacing issues that involved the bars rather than the frames. If he had first incorporated a frame into his hive, he would have had to figure out how to separate the frames from the sides of the hive in addition to the cover. Unknown to Langstroth, these issues were vexing users of the new frame hives, such as the Munn hive or Debeauvois' frame hive that were being touted in Europe at the time (Kritsky 2010).

In the Fall of 1851, Langstroth discussed using frames with his friend Rev. E. D. Sanders. Langstroth (1893a) wrote, "Full of enthusiasm, we discussed, until a late hour, the results which both of us thought must come from using movable frames instead of bars." He sketched out a frame on 30 October 1851 with the critical 3/8" gap between the frame and the walls of the hive. Basically, he applied the solution that stopped the bees from gluing Bevan's top bars to the hive cover to all sides of the frame, and found that if a hive was constructed according to those dimensions, "the whole comb may be taken out without at all disturbing it by cutting."

The essence of the modern hive was in place. With the incorporation of the bee space around the entire frame, Langstroth had succeeded in inventing a true moveable frame beehive. While the hives we use today bear little resemblance to the first hive that Langstroth patented, the fundamental principle that made it practical remains unchanged. BC

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The Ugly Side of Wax Moth I P M

Mike **Hood**

Greater wax moth larvae on destroyed comb.

Resist the temptation to use chemical controls because there are many safe alternatives.

PART I:

This article is a continuation of a series of articles on beekeeping integrated pest management. There are many options available to beekeepers to practice integrated management of wax moths which are troublesome pests, especially in the southern U.S. when conditions are favorable for their rapid reproduction. We will cover first the non-chemical tools that are available and end with chemical control.

Wax moths were the leading beekeeping pests in some regions of the U.S. until the mid-1980s when parasitic mites were discovered and quickly spread to all regions of the country. But wax moths are still a problem and damage from these pests can be significant if certain rules of control are not followed carefully and timely. There are two wax moth species, the greater wax moth, *Galleria mellonella*, and the lesser wax moth, *Achroia grisella*, which occur in all regions of the U.S. The lesser wax moth is much less a problem than the greater wax moth. Control recommendations discussed in this article are specific to greater wax moths, however I suspect that the same recommendations will control lesser wax moths, as well.

Acceptable Pest Levels. This is another beekeeping pest that a treatment threshold system has not been developed. However, beekeepers have many IPM tools available to control this pest. The beekeeper must resist the temptation of chemical control when there are many safe alternatives to control wax moths. Some beekeepers have a zero tolerance for wax moth damage, but slight damage in stored comb can be tolerated easily because bees are excellent home repairers. But, major damage by wax moths in stored comb is not acceptable by most beekeepers who discard damaged frames or strip frames and insert new foundation. This can be a major expense to the beekeeper in the form of labor and equipment. In addition, bees have to expend valuable resources to produce the wax needed to build new comb when those resources and energy could be used to produce more surplus honey. So, beekeepers should strive to minimize wax moth damage by *timely* use of good beekeeping pest management practices. When beekeepers become careless and overlook some well recognized wax moth control recommendations, this pest can become a major problem, especially in stored comb. They can also become a problem in comb or chunk honey that is produced for human consumption.

Greater wax moth larvae. (photo by Susan Ellis, USDA APHIS PPQ, Bugwood.org)

Preventive Cultural Practices. Beekeepers should maintain strong and healthy colonies by practicing good colony management to help the bees defend against wax moths. Good colony management starts with a good laying queen that can regulate the colony population to maximize the chance of survival. Her genetic makeup is paramount in that her progeny must be able to sustain the colony in the presence of various diseases and pests, including wax moths. A young laying queen will help prevent swarming and hopefully prevent supersedure which may lead to stress on a colony.

In general, a high bee-to-comb ratio is recommended for effective wax moth control. Swarming, supersedure, starvation, robbing, small hive beetles, or *Varroa* mites can weaken a colony and lead to wax moth problems. Wax moths are opportunists. They are secondary invaders just waiting for a chance to become established and gain the upper hand. Once the colony's health balance tilts in favor of wax moths, the colony is normally doomed. Attention

Greater wax moth eggs. (photo by Walter Peraza Padilla, Universidad National, Costa Rica, Bugwood.org)

Webbing left behind by wax moths.Notice the bee pollen which is highly attractive to wax moths.

to detail in good beekeeping management will go a long way toward wax moth control. Even skunks, bears, or human intervention such as over-manipulation by the beekeeper or vandalism can stress a colony and lead to wax moth problems. Beekeepers should be careful with *Varroa* mite detector boards and hive bottom beetle traps because they provide harborage for wax moths.

When honey-filed supers are removed from colonies, the beekeeper should make a habit of protecting hive products from pests. If the beekeeper operates in an area where wax moths or small hive beetles are problematic, the honey should be extracted within about two days. If plans call for holding the honey prior to extraction more than two days, the beekeeper is highly advised to take appropriate action in protecting the honey supers from these pests.

One preventive measure a beekeeper can take to reduce wax moth problems in stored comb is to make every effort to prevent brood production in honey supers. Brood production leaves behind small amounts of pollen and cast larval skins which are a more attractive food source than cells that have a history of just honey storage. Newly drawn wax combs where only honey was stored are not very attractive to wax moths, and thus safe from their attack.

Wax moth cocoons on inside of super box. Notice schooped out damaged area.

Beekeepers should resist the temptation of adding more honey supers than there are bees to cover and defend against pests such as wax moths, especially in late Summer or Fall. Placing too many wet supers on colonies for cleanup can also be a problem during times of the year when wax moths are most active. Wet supers should be placed only on strong colonies for cleanup.

Monitoring practices. Adult wax moths are normally present in most apiaries during warmer months. They are nocturnal and spend their daytime hidden in bushes, trees or other sheltered places. In early evening, the adult female moths fly and often sneak by guard bees which have relaxed their protection duties. Weak colonies are not capable of protecting their colony entrance from intrusion by this pest, but even strong colonies are often vulnerable to passage of wax moth adults. Once inside the hive, adult female moths lay eggs in protected cracks and crevices and exit the colony in the early morning hours undetected by the bees. If adult wax moths are found in the hive during daytime hours, the colony is weak and is likely highly infested and demoralized.

If wax moths are becoming a problem in a bee colony, their presence is normally obvious when the beekeeper opens the hive and identifies larvae found inside. The larvae are most often found tunneling inside frames leaving behind damage and webbing. Careful identification of larvae is necessary because wax moth and small hive beetle larvae are very similar in appearance to the untrained eye. Wax moth larvae have three pairs of thoracic legs on the front end of the body and have other uniform pairs of prolegs along the rest of the body. Small hive beetle larvae have only three pairs of thoracic legs on the front end of the body and *no* prolegs are present. The wax moth larval body is soft and fleshy, whereas the small hive beetle larval body is rigid and hard. Many times both pests can be found active in the same bee colony. Wax moth larvae leave behind a mess of webbing in comb, but small hive beetles do not. Sometimes the wax moth webbing in brood frames results in trapping bee pupae in their cells and prevents the young adult bees from emerging. This problem is called galleriasis. Mature wax moth larvae excavate the inside of wooden super boxes or hive frames for their pupation sites leaving behind scooped out areas in the wood that can harbor or provide hiding

places for hive pests (see photo).

Genetic control. Wax moth control can be enhanced indirectly by the use of bees that have been selected for resistance to disease and other pests. These resistant strains of bees should be more tolerant of some of the primary problems that affect bee colonies which often create stress conditions that "open the door" to secondary invaders like wax moths. Bees that have been selected for hygienic behavior are normally better housekeepers which remove colony debris that creates conditions favorable for increased wax moth reproduction.

Mechanical control. Traps can play an important role in a wax moth integrated management plan because of their safety in providing control without fear of hive product contamination. No wax moth traps are marketed in the U.S., but a homemade trap can be easily constructed that may be used in the apiary as well as in the honey house or comb storage room to attract and kill wax moth adults (see photo). These traps can be constructed from readily available, low cost materials. I have seen several versions of these traps, but most use a two liter clear soda bottle with lid secured. A 1.25 inch (3.2 cm) diameter hole should be cut in the side of the bottle just below the shoulder of the neck. The ingredients for the bottle trap include one cup white vinegar, one cup granulated sugar, one cup water, and one banana peel. The bottle should be set aside a few days until the contents begin to ferment after which the bottle should be suspended a few feet off the ground using wire or string making a noose opposite the side of the entrance hole. Wax moths adults will be attracted by the trap contents and will enter the bottle entrance and die because they are unable to escape.

Physical control. Wax moth damage is expected when honey-extracted comb is stored in dark, warm, or poorly ventilated places. Unprotected, wet supers are highly attractive to wax moths. From experience, I have learned to never store freshly honey-extracted supers in tightly sealed trash bags, thinking that you have excluded all life stages of wax moths. Invariably, wax moth eggs or larvae show up unexpectedly in the equipment and the comb can be destroyed in a few weeks in a warm storage area. One exception is to freeze the comb, allow the comb to thaw in a wax moth free room till dry, then store the frames in tightly sealed bags.

On the other hand, maximum use of light and ventilation is recommended to control wax moths. Beekeepers who have only a few colonies can easily take advantage of these two physical factors. A very effective and economical method of moth control can be achieved by storing supers of comb or individual frames of comb by wire from the roof or rafters of a room or attic which has good light and ventilation (see photo). If wax moths have already become established and webbing is present in the comb, the use of light and ventilation option of wax moth control is not recommended.

Other wax moth safe storage options are available to beekeepers who have lots of equipment to store. At Clemson University, we have a storage building (see photo) which is used mainly for equipment storage, especially supers of drawn comb. The building has large open air windows and ceiling that are covered with hardwire cloth to exclude bees and wax moth adults. Supers of drawn comb are stacked in a manner that allows a minimum of one inch distance between supers. We have had supers of comb stored in this building year-round with minimum wax moth damage mainly due to good light and ventilation.

Two liter bottle home-made wax moth trap. Contents include one cup clear vinegar, one cup sugar, one cup water, and one banana peel.

A similar approach but practiced normally on a larger scale is the use of "wax moth-safe" storage rooms with single frames resting on frame holders or hanging from a ceiling of an open air building having no sides Frames were stored about one inch apart in a well ventilated room which provided circulating air that prevented heat from rising to the point necessary for wax moth development (Popolizio and Pailhe 1973). According to the authors of this report, the storage room was 3.2 x 3.2 meters and was 2.5 meters high on the highest side which faced north and 2.0 meters high on the lowest side which faced south. The storage room had four floors and had a total holding capacity of 1,440 frames.

Temperature manipulation and carbon dioxide fumigation are other forms of physical control that are recommended for rapid, safe, and effective wax moth protection.

Open air attic that provides a good storage space for hanging supers of drawn comb for wax moth control.

Supers of drawn comb stored in beekeeping equipment storage building, Clemson University. Notice wax moth trap placed on super.

These control measures can be used for stored extracted comb or hive products intended for human consumption, such as comb honey or pollen.

Cold Treatment. Minimum cold temperature storage time required to kill all life stages of wax moths in honey-extracted comb include: 20°F (-7°C) for 4.5 hours, 10°F (-12°C) for three hours, or 5°F (-15°C) for two hours. Additional time should be given for equipment to reach required minimum temperatures, especially in hot weather or large capacity freezers. These temperature exposure periods will have to be increased to kill wax moth larvae in comb honey. Wax moth development is accelerated at higher temperatures, so comb honey should be protected from this pest beginning immediately after harvest.

Freezing individual frames containing wax moth larvae from live bee colonies is recommended to control this pest, but this will rarely result in successfully salvaging a weak colony. Usually, a more serious primary problem such as queen failure, mites, or disease is responsible for the poor condition of the colony.

Heat Treatment. Heat can be used to kill all life stages of wax moths by using the following exposure periods: 115°F (46°C) for 80 minutes or 120°F (49°C) for 40 minutes. Treatment exposure periods should not begin till specified temperatures are reached. Combs should not be heated above 120°F (49°C) because combs will sag above this temperature and beeswax melts at about 148°F (64°C). Frames of comb should be heat-treated only in the upright position and should not be handled until allowed to cool. Heat treatment should be used only for comb containing little or no honey (Shimanuki and Knox 1997).

Carbon Dioxide Treatment: carbon dioxide can be used as a fumigant to control wax moths in stored comb or comb honey. Air-tight treatment rooms or fumigation chambers are required to hold 80-98% carbon dioxide levels which have to be maintained continuously for up to five days at the lower levels to kill all life stages of wax moths. At the highest level (98% carbon dioxide) with a temperature of 100°F and relative humidity of 50%, only four hours are required to kill all life stages of the wax moth. ***Precaution*: although no harmful carbon dioxide residues are left behind on treated comb or inside the fumigation chamber following use, a fully charged carbon dioxide room is hazardous to humans and can result in death.**

Other physical control recommendations for reducing wax moth problems include cleaning equipment like bottom boards in live bee colonies at least annually to remove debris where wax moth larvae can escape detection by bees. Cleaning up old empty boxes with a hive tool to remove any overwintering wax moth cocoons is recommended, also. Another good idea is to freeze or burn damaged comb which could possibly harbor wax moths. BC

In this article, we have discussed several IPM options that are available to control wax moths in live bee colonies as well as in stored comb. Next month we will conclude this two article series on wax moth integrated management by discussing biological and chemical control of this pest.

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Finding Queens

Larry **Connor**

Use smaller colonies for beekeeping activities requiring frequent queen checks (such as queen mating) because it is easier and less work to find the queen in a smaller unit rather than a full-sized colony. This is especially true of an increase hive or a mating nucleus. While it seems logical that it would be easier to find a queen in a small colony than a large one, experience shows that some queens effectively hide in a very small group of bees. Some queens will move to the side or bottom of the hive and will not be found on the brood or honey frames. So a thorough search is necessary when looking for a queen. When your queen finding success is low, rather than getting frustrated, it is often better to return to the hive to find the queen on another day, perhaps separating boxes with queen excluders and waiting until all the eggs have hatched. When you MUST find a queen, have a plan in mind how you will do this. Here are some general guidelines for locating the queens in a hive:

Do I really need to see or find the queen? Before you start to make yourself a little bit crazier than you already are, ask yourself *is it really necessary that I find this queen*: Do you need to just verify if a queen is laying eggs and performing well, or is it necessary to actually see the queen to remove her or verify that the queen in the hive is the one you want to have there? Finding the queen is the only way to know for sure that she is not a *daughter queen* or a *side-comb virgin* (queens the bees raised on brood comb used to make up or added to the hive). To absolutely verify a queen she must be clipped and marked, otherwise you not be sure of her origin. Another time when you need to find the queen is when you are making nucleus hives and need to know that you are NOT moving the queen to the new increase colony (unless, of course, you meant to move her and leave a new queen in her place). And to replace a failing queen, or one that has produced a defensive colony, or is a poor performer (low egg-laying rate, disease) you must find her to remove her. For some beekeepers the simple act of finding the queen is a matter of beekeeper ego, or sense of accomplishment. However, in your routine inspections, it is only necessary that you recognize a good brood pattern featuring a good pattern of eggs and larvae. For most colony inspections, evidence of a large area of healthy brood is all the proof you need to know that the queen is present and doing her job.

Tips on finding the queen. Especially with unmarked queens and queens with darker or cryptic markings (making them harder to see than a bright yellow queen), develop a systematic method of inspecting a hive. If you have more than one hive body, set apart hive bodies and supers so you can work each one independently, and from side to side, looking for the queen. Make sure the queen cannot move from one hive body to another, thwarting your hard efforts! Start with outside frames and work across the brood nest. Experienced beekeepers place the already-looked-at frames against a hive stand, wood against wood, so no damage is done to the worker bees or the combs. To make sure no harm is done to the queen or bees, other beekeepers use an empty hive body to place combs into as you work. Once all frames have been inspected, check the sides and bottom board of the hive for the queen. Take the time to look at the outside of the hive too, especially if you took a long time (over five minutes) during your inspection. Then replace the frames, re-inspecting as you return them to the hive body, restoring the order and arrangement of the frames as you found them.

Shape and thickness of the queen's body. When there are signs of a laying queen (eggs and young larvae) use the longer size of a laying queen and her swollen body (dorsal-ventral thickness) as a visual clue to help you find the queen. Remember that the abdomen of the drone is rectangular and wider than the queen's longer and more tapered body. When a queen is walking on the comb, searching for a place to lay eggs, she will often be noticed by a flash of her large abdomen. This is especially true of the yellow queens. When a comb is removed from the hive body, look on the *next* frame to see if the queen is on that frame. Then look at the frame in your hand, using a top over bottom rotation to search for her thickness of the body. Then inspect the frame edges. Most queens move away from the sunlight, so the rotation is very helpful if the queen keeps moving to the darker side of the frame. Work quickly and do not spend more than a few seconds per side of the frame before setting it down and moving to the next frame. If a second person can take the frame and inspect it, this doubles the chance of finding the

Smaller is better when it comes to finding queens.

Queens can find the best places to hide.

queen. Just hand the frame to the other person, and have them put the frame down so the queen, if missed by both of you, is not harmed and cannot move to another hive body or super.

Queens will hide under a group of bees, perhaps at the corners of the frames. These groups of bees may fall off the frame; so all inspections should be done over the open hive. Some queens leave the hive, and may be found anywhere. I have found queens on the ground, on the outside of the hive, and crawling inside my pant-legs. Remember that virgin queens are able to fly when you inspect the colony. Don't panic if they do, for they often fly back to the hive. They know where they are, even if you don't!

Must-find-the-queen-or-else scenario. When all else fails, set up two boxes separated by a queen excluder. Frames may be in the lower box, but the upper box should be empty. Shake or brush the bees into the box, and use puffs of cool smoke to drive them down into the frames. Once the bees have settled down, look at the inside of the box, as the queens and drones should be all that is left. I will admit I have only needed to do this a few times, and it is a lot of work. I prefer to come back a few days later for a return search.

Requeening at the time of honey removal using a bee blower. Most small-scale beekeepers may not justify the expense of a bee blower, a leaf-blower device modified to blow bees off frames without killing them. This is an effective way to remove bees from honey and brood and may be used to remove the queen and replace her with a new queen. When timed with the Summer or Fall honey harvest it may work quite well. Since all the bees in the hives will be blasted into the air or onto the ground, suit up with all legs and arms taped and bee-proofed. Systematically place each super on its edge on the box below and blow between the frames in the direction of the hive entrance. Another person may remove the honey supers and put them in the truck or cart. Don't walk on the bees! Keep honey supers covered, as the bees find them quickly. When you get to the brood nest, do the same thing, working down to the bottom board. It is often harder to get the bees to leave the brood, and you may need to move frames a bit using your hive tool to get the bees out.

After the bottom box has had its bees removed, replace it on the hive stand and immediately place a piece of queen excluder material at the entrance to prevent the queen and drones from reentering the hive. Place a newly mated replacement queen in a cage with a candy plug in the center of the brood nest. Replace all the boxes that make up the brood nest and restore the lid. Most of the bees are still on the ground or in the air at this time. All the honey in an entire apiary may be harvested and all the colonies requeened with a crew or 2 to 4 people working in an orchestrated manner. Blow all the bees in the direction of the colony entrance so the bees will regroup, use their scenting behavior, and return to the hive. Do not walk in the area where the bees are collecting, but stay behind the hive(s). After all the honey is harvested and the bees have settled and most have returned to the hive, you should be able to find and either collect or kill the queens at the entrance of each hive.

This is total emersion beekeeping – bees in the air, on the ground and all over your bee suit and veil. Avoid stepping on masses of bees. It is difficult work, can be sticky and messy, and pretty overwhelming for the inexperienced beekeeper. Stick the bee blower into your bee suit to cool off! The advantage of using this system is that the colonies are requeened with newly mated Summer queens (perhaps from your own local stock), and should create strong fall and Winter clusters when managed for stores and pest control. There is a break in the brood rearing as the bees release the queen via the candy plug, and this provides a chance for some *Varroa* management.

Making Increase colonies during the nectar flow – During the nectar flow new and smaller colonies often fail to produce much honey. Small swarms, late swarms, certain package bees and slow builders often peak in population after the nectar flow is over. Using a method discussed by G.M. Doolittle, I make new colonies, complete with a new queen, without finding the old queen, and do this during the nectar flow. Colonies in single deep boxes or two medium boxes are in a growth mode (more nurse bees than foragers), and may be used to develop another new colony with a new queen. This has an added advantage – if the queen in the swarm or slow building colony is not one you want to keep, you can make increase colonies from the queen's colony and ultimately replace her!

As the colony is building, and depending on the strength of the unit, I add a second or third hive body, seeded with one or two frames of honey from below. Several days later I return with a queen excluder and a caged virgin or mated queen. In the lower box I find at least two frames of brood and place empty frames to take their place (arranging the brood nest so there are no gaps, although a vigorous colony will move onto an empty frame or foundation and turn it into a brood frame). Placing the excluder on the hive, I then shake all the bees off the frames above the box, as well as the frames of brood, at the entrance of the hive. The two frames of brood are placed in the center of the brood area with the queen caged so she cannot be released. Thus the cork is left in the wooden cage, or the plastic cap left on the plastic cage. The original frames of honey are moved to the side, along with any other frames the bees are filling. The rest of the box is filled with frames, drawn or foundation.

Four to seven days later I return to the hive and set the box onto a new hive stand, or transfer the frames to a five-frame nucleus box. Reduce the entrance so there

is less chance of robbing. Since most of the bees on the brood are nurse bees (many of them newly emerged), they will not fly back to the parent colony. The bees working the nectar frames often fly back, but the colony now has stored food and probably does not require feeding. Once everything is settled, I remove the cork or plastic cap from the queen cage and let the queen emerge in a few hours to a day or so, depending on the amount and hardness of the queen candy in the cage. This will give the colony time to be rid of the odor from the parent queen (she did not have access to the combs, so her odor dissipates quickly).

Recheck the colony in five to seven days to make sure the queen got out of the cage. Virgin queens are not easily seen, but the mated queens should be laying eggs by then, filling spaces where bees are emerging on the brood frames and then moving to the frames with nectar/honey and stimulating the bees to move it out of the way. Do not be surprised to find double eggs in the bottom of the cells, as the queen may be out producing the bees. This will go away in a few days.

When selecting brood frames I like to find those where bees are emerging, since this will give the new colony a boost of immediate young bees that are not imprinted on the old queen's pheromones, but freely adjust to the odor message of the new queen.

Should the queen be found dead in the cage, replace her and follow the delay in release as described above. I see this as an advantage, knowing a queen is dead rather than wondering for weeks if she is there!

The advantage of this system is simple: a colony that will not do much this season can be put to work making new bee colonies, and these can then be managed for overwintering as nucleus or single deep hives, and without the need to find the queen! This is a huge step for many new beekeepers and small-scale operators who are intimidated by the queen finding process. *You do not need to find her, just make sure she does not go to the new increase colony.*

Joys of marking. Marked queen are so much easier for beekeepers to see than unmarked queens that I recommend all queens be marked in new beekeepers' operations. Use a lighter or brighter shade of red, blue and green so they are easy to spot. With the five-color queen marking rotation, this dates your queens, and helps you maintain your records and queen replacement schedule. Use drones to practice marking, giving beekeepers at field days a chance to learn how to mark a drone or queen without pinching the abdomen, pulling off the head, wing or leg, or administering other abusive treatment!

Virgin Stealth. I am an advocate of using virgin queens because they are less expensive to purchase and they will mate with your local drone population, increasing the chance of establishing and maintaining locally adapted stock. The biggest problem I have experienced is getting beekeepers to introduce virgins properly. A virgin queen needs to be handled like any queen, in a cage with queen candy for slow release. Beekeepers need to realize that these queens do not have swollen abdomens and lack the dorsal-ventral swelling and the lengthening that occurs after mating and when the ovaries expand to produce eggs. Virgins often move faster, and have more

Evidence of a good brood pattern, and as much brood as there shold be is usually all you need to find to know your queen is OK.

of a stealthy behavior when it comes to finding her. If you used a caged virgin, leave her in the cage until she has been in the hive for at least three and ideally five to seven days. Then remove the cork or plastic plug so the bees will release her via the candy. Later, when she is in the process of mating but has not started laying eggs (or you cannot see eggs), *look for cells with polished bottoms*, ready for the queen to lay into. This is the best evidence I have for a queen that is present and getting ready to begin egg-laying (ovipositioning), but is still in her stealth mode (smaller body and rapid movements). If you mark the virgin before mating, you know it is your queen and not a side comb virgin (one the bees produced from brood used to make up the nucleus or after a period of queenlessness). Using a marked virgin insures your records are correct and you have the queen you wanted. It is a really wonderful experience to return to a colony and find the queen that you put into the hive as a virgin now swollen with eggs and laying a beautiful pattern. That color mark you added after she emerged from the cell but before you put her into the hive is your proof of performance and bloodline. BC

Larry Connor is off to Georgia in September and looking forward to seeing a lot of friends there! Some of these topics will be discussed there.

West Virginia Passes Immunity Law

Dan O'Hanlon

In April of this year, West Virginia became the first state in the nation to pass a law giving beekeepers immunity from civil liability for ordinary negligence. This law came about as a result of strong support by the leadership of both the House and Senate. We are fortunate to have a State Senate President, Earl Ray Tomblin, whose father is a beekeeper. Additionally, House Speaker Richard Thompson was raised by a grandfather who was a beekeeper. The bill passed the House 94-2 and the Senate 34-0. Finally, it helped that the honey bee is our state insect!

The law requires that beekeepers register their hives. It also mandated the WV Department of Agriculture to promulgate Best Management Practices [BMP] for beekeepers. After extensive review of the BMPs of many other states, the Department promulgated 14 rules that beekeepers must agree to comply with to receive immunity from civil suits. All beekeepers who abide by these provisions will have absolute civil immunity from ordinary negligence.

The rules themselves relate mainly to urban beekeeping and being a good neighbor. They require beekeepers to post a warning sign in every apiary and to limit the number of hives in any one location based on the size of the lot. This varies from no more than four hives on a half-acre lot, to no more than eight hives on a lot of more than an acre. If all the hives are at least 200 feet from all property lines, there is no limit on the number of hives at the apiary site.

Hive entrances must face away from neighboring property and the beekeeper must have a six foot barrier if the hives are within 50 feet of the property line.

An interesting rule requires the beekeeper to maintain a water source near the colonies at a distance less than the nearest unnatural water supply. This should help keep the bees out of the neighbor's bird baths and swimming pools. The rules also prohibit locating a hive within 50 feel of where any animal is tethered or kenneled so they could not escape from stings. The last of the 'good neighbor rules' prohibits opening a hive when neighbors are present in the immediate vicinity.

WV beekeepers are strongly encouraged to avoid purchasing queens and bees form areas known to have Africanized honey bees [AHB]. They are also required to replace all queens which head colonies which exhibit such defensive behavior as may be injurious to the general public or domesticated animals.

Finally, beekeepers are urged to manage all their hives to prevent swarming.

The remaining rules all deal with special conditions such as requiring that bees used for public demonstrations, entertainment or educational purposes be enclosed so as to prevent release in public. Similarly, bees being transported need to be screened to prevent escape, and a caution sign posted at sights where bees are collected prior to shipping. All bees being transported must be secured and netted.

The last requirement is that all pesticides and control agents must be discarded properly following label directions.

The Department reserved the right to promulgate additional rules in the future if AHB became established in West Virginia, but these rules are something beekeepers can live with for now.

Because the legislation allowed the Department to issue emergency rules, they will remain in effect until the end of the next legislative session. During that session, the legislators can add or amend these rules. As you might expect, every beekeepers sees something in the rules that they would have written differently so the danger is that beekeepers will descend on the state capitol demanding their representatives to change this rule or that one to suit their operation. Fortunately, wiser heads are urging all beekeepers not to open Pandora's Box and allow non-beekeeping delegates and senators to begin adding rules that they feel would better regulate bees in West Virginia. After all, the rules are completely voluntary so you can simply run your operation as you see fit, the same as you did before the law was passed. You will still be subject to civil suits, but the choice is yours.

The beneficial effects of the law have already been felt by some beekeepers. At our last club meeting, several beekeepers told me they contacted their insurance companies and received significant reductions in the insurance premiums on their beekeeping policies. Beekeepers have written to several other insurance companies as well as to our Insurance Commissioner asking them to give us rate reductions similar to what doctors received on malpractice policies when tort reform lowered their civil liability.

West Virginia beekeepers are pleased and proud to be in the first state in the nation to help shield beekeepers from lawsuits. They hope that many other states will follow our lead and protect their beekeepers. A copy of the law and the rules can be found at **www.BeeCulture.com/contents/links.cfm**. BC

Judge Dan O'Hanlon is an active member of the West Virginia Beekeepers Association and the Heartland Apicultural Society.

Modern beehive with migratory outer cover.

THE MODERN BEEHIVE

James E. **Tew**

I suppose that it could be said that neither LLL's original hive design nor the variation of his hive design that we use today is absolutely perfect, but by surviving this long, his fundamental design is clearly the least imperfect of all the previous hive styles.

The traditional hive

The common white beehive, sitting slightly askew in a slightly unkempt beeyard is the fundamental essence of my personal existence. For my whole adult life, bees and beehives have been at the center of my professional being. *(At this point, I struggle for descriptive words.)* How could this simple *"thing"* be so central to so many of our lives? I don't have the answer.

Apparently, the common beehive is indicative of a craft – our craft. I never get enough photos of hives and beeyards. After all these years, I still react when I see a hive while riding along roadways. Even when I am expecting to see hives that have been at a particular location for years, I still look to be sure they are still there, where they should be. I suppose I could say that the traditional beehive is the trademark of my life; but it's a trademark I share with all other beekeepers around the world. I simply cannot imagine my life without common beehives being a part of it. I want no other hive style other than the hive design to which I am completely accustomed. I have stacks of traditional hive equipment. Why would I want the design to change? (I don't.) There are honestly tons of books and publications pertaining to the beehive and its function. Can the design of the basic hive ever be changed? Should it ever be changed? Has the hive design been tweaked as much as it can be? I don't have the answer.

Standardized imperfection

I ask you to help me at this point. Can any one of you think of a device so widely used, so common, so indicative of an industry that more than 100 years later it is still in use – even though it is far from perfect? A hammer? That's a tool that is traditional, simple, and imperfect. (Busted thumbs and banged up boards.) Buttons? We all still use buttons after hundreds of years. But we now have zippers and Velcro® – but we also still have buttons. But buttons are not really indicative of an industry. So – not a thing. I'm sorry. Nothing immediately comes to my mind that compares to our long-term use of an obviously blemished design – the beloved common beehive. So why even write about it? Because the way the hive functions in book environments is not how the hive functions in real apiary environments. Experienced beekeepers know this. Inexperienced beekeepers will soon grow to know it.

L.L. Langstroth

Since the time of his hive design invention, this man, now long dead, has directly affected the life of practically every beekeeper in the modern world and will continue to affect beekeepers yet to come. Our rubbish heap of discarded hive designs would truly make an impressive burn pile. Very few examples of these early hive design failures survive now. Ironically, without the intervention of A.I. Root, even Langstroth's design could have been tossed onto the burn pile.

While every one of us has examples of A.I. Root-modified Langstroth hives (today's modern hives), specimens of original-styled Langstroth hives are desperately in short supply. I have had the privilege to examine a few of these original units. Even though LLL probably never saw the specific hives in our museum, they were of his

design. When all other designs passed into oblivion, this basic hive design survived. Clearly Langstroth deserves our continued appreciation and adulation, and others more qualified than I have addressed that subject in this publication. My purpose here is to review and reflect on the actual use of this vintage, time-tested hive design.

Humans are not bees

Humans are not bees. That's a nonsensical comment, but humans design hives primarily for human convenience and not always for bee comfort. True, bees must accept the artificial domicile or the design is useless. But, I don't know of a single natural nest that bees have ever built that consisted of straight combs in broad, flat pieces – each hanging side by side in wooden frames. To the best of my knowledge, every antique hive in our museum is built to human specifications and not necessarily to the bees' needs.

Blemished Perfection

It is not my present intention to criticize any author of any book anywhere. But various classic topics like: bee space, equipment interchangeability and hive mobility are commonly discussed in definitive, specific terms in text books and in presentations. These concepts are always presented neatly and cleanly. In most cases, that is the proper thing to do. But many aspects of the modern hive's design and use simply are not neat and clean. Experienced beekeepers know these characteristics and they accept them.

An original Langstroth hive with fixed height.

Bee Space

Thousands of times, I have said that bee space is 1/4-3/8". Not just me – countless other authors have said it, too. Ironically, the statement is mostly true but the fractions are approximations and not the precise values that I and others have always presented. Bees will crowd bee space if the hive is crowded and a strong flow is ongoing. In some instances, some bees will crowd bee space for reasons known only to them. Not all bees precisely follow the rules.

If hives are not routinely manipulated and scraped, hives that are perfectly in tune with bee space concepts will – over time – become so embedded in propolis and wax as to nearly hopelessly stick the frames in place. New bee equipment is enjoyable to work while old, entrenched frames will frequently be destroyed by the frame removing process.

Bee space functions only as long as the colony is properly managed and the hive routinely groomed.

Standardized equipment and dimensions

Our hive equipment is ***mostly*** standardized and will ***mostly*** fit if different company brands are mixed. Slight changes in equipment size, when working in combination with the issues of bee space discussed above, will likely result in burr comb and stuck equipment. What to do? Nothing. Mix the equipment and deal with the problems when you must. Ideally, a beekeeper would purchase all their hiveware from a single manufacturer but that simply is not practical.

Modern standardized hive equipment is reluctantly interchangeable. In odd places and at odd times, expect mixed equipment to be soundly stuck with extra comb and propolis.

We assume that standardized hives are precisely made from dimensions that are the results of generations of observations and tests that resulted in *"just the right sizes"* for today's individual pieces of hive equipment. That statement may or may not be true. If it is true, I can't cite cornerstone papers or the scientific works that show that a deep should be exactly 9-1/8" deep while a deep shallow (Illinois depth) should be exactly 6-5/8" deep.

Our hive sizes are primarily the early results of nominal lumber sizes and thicknesses and how scrap pieces could be used to form other hive components. This was efficient from a manufacturing stance. For instance, the scrap cutoffs from an early twelve inch board might leave enough of a strip to serve as the rim for the outer cover. This was practical production but not necessarily biologically insightful.

Our historic hive dimensions were greatly influenced by early lumber sizes and thicknesses – not comprehensive bee biology studies[1].

[1] A disclaimer – the old bee literature is vast – far too vast for any one person to digest. I have no doubts that, in years past, studies were done on various hive sized equipment. But it seems that those studies were performed on equipment already in production. In essence, the authors were selecting from what was already out there.

Propolis used to modify bee space.

Resultant clumsy size

So, for whatever reason, the modern-day Langstroth hive is essentially a standard size and shape. As the seasons change, equipment is added or removed as needed by both bees and beekeepers. This is a practical arrangement until a colony needs to be moved from one location to another. Without either a good friend to help or some kind of mechanical loading device, a hive move requires an extremely stout beekeeper to pick up a full two-deep colony and load it onto a truck.

And the colony components should be affixed to prevent the various pieces from shifting. Hive staples are still available from bee supply companies. They always have been – and still are – a poor solution to attaching hive components. Another poor procedure is to nail temporary slats on the sides of the hive. Both staples and wood slats require banging on the hive sides – an action not lost on the bees. Modern ratchet straps or metal banders are improved options for today's beekeeper. But, the hive must be tilted to get the strap underneath the hive and multiple ratchet straps result in multiple tangles--deal with that problem in the dark. Additionally, these devices are not cheap but hive straps work better than staples.

So it's true – hives are mobile. Beekeepers move hives all over this country for pollination – but it is **hard** work – and it's work that requires multiple people or specialized loading equipment. Leaving colonies on trailers or dedicated trucks is the only way I know to quickly and easily move colonies without breaking a sweat.

Hives are mobile, but either hard work or specialized equipment (or both) is required to complete the task.

Interestingly, early hives of LLL's ilk were made of 7/8" lumber and were even heavier than today's comparable hive equipment. It seems that hives have always been heavy.

Langstroth's way and our way today

Based only on the original Langstroth hives that I have examined, Langstroth's way of keeping bees is the not exactly the way we do it today. In fact, it seems that changes were made early to some of his hive concepts.

Apparently, Langstroth hives had a fixed size and height. Hive variations may have been larger or smaller, but the supering that we perform today was not an aspect of honey production in those old hives[2]. The brood nest was small by today's standards and the supers would have been considered to be tiny. As these small boxes were filled, they were removed by the beekeeper. So, the actual Langstroth hive had a fixed height and a fixed maximum weight. At some point, today's beekeepers have probably seen photos of three deeps with three supers on top of all that. Such hives can easily be higher than a person's head.

For such a heavy hive, Langstroth may have conceived the original hive design, but I assume that he never saw the need for a meaningful hive stand. Today, while we have a standard hive, we do not yet have a standardized hive stand to go beneath the colony. Cement blocks, tire rims, bed frames and beekeeper-constructed wood frames are common hive stands. None seem to be great. So a seasonally tall hive will be required to sit on an improvised hive stand. It's a rare stand that does not settle and lean over time – just like Pisa's famous tower.

It would not be uncommon for a hive to be tall, top-heavy, positioned on an improvised hive stand and capped by an outer cover that could possibly blow off during a storm. Don't get me started on hive-top rocks to keep the outer cover on. And don't get me started on hand-holds that are barely large enough to get three fingers in to lift a box that could weigh upwards to 85 pounds. Does anyone sense that I am describing the perfect hive here?

I suppose that it could be said that neither LLL's original hive design nor the variation of his hive design that we use today is absolutely perfect, but by surviving this long, his fundamental design is clearly the least imperfect of all the previous hive styles. And while today's standard hive is, to a fault plain and simple, that simplicity makes it possible for novices to build hives themselves or results in hives that are easily repairable when necessary. The modern new hive smells good. The wax foundation smells good. We may add screen bottom boards; we may make hives from expanded plastic foam; or we may paint with modern latex coatings, but Langstroth's original concept still lurks within. So, while clever beekeepers will continue to tweak and modify the hive's design, it appears that our common, imperfect beehive will be a beekeeping beacon for years to come. BC

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[2]My observations on Langstroth's hive designs come from the few specimens we have in our museum and from construction plans taken from his book; however, I do not claim to know the full scope of LLL's experimentation with various hive designs.

FALL FUNDAMENTALS

You'll do things a bit sooner in the North than we do down here, but it's the same things. Ignore them at your peril.

Jennifer **Berry**

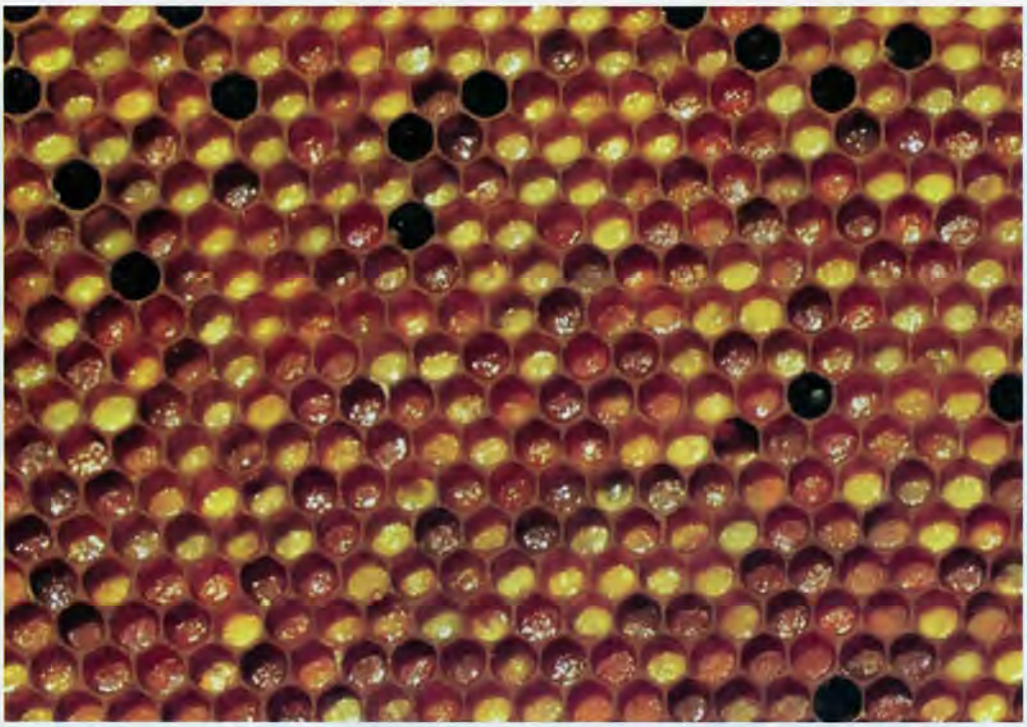
So far, 2010 has been an exceptional year for most of us southern beekeepers. Years of disappointing nectar flows, due in part to water-starved landscapes, finally came to an end. Plus, as opposed to last year, when the Spring rains came this season they stopped just as the bloom began to open letting the sun shine in. Spring and Summer flows in some areas were off the charts. Beekeepers were stacking supers higher and higher as the bees tried to keep up with the flow. "So many blooms, so little time," became our motto. And the pollen . . . did I mention the pollen? Loads and loads of multi colored pellets being stuffed into any available cell. Assuming we are diligent beekeepers now, our bees could be stronger than ever coming out of the Winter and into next Spring nectar flow because for the first time in years our bees are extremely well fed. But Winter preparation in September? Absolutely! This is the time to re-queen if necessary, fatten up those bees, reduce *Varroa* populations, and take care of any other issue that may have occurred during the season. So grab those evaluation sheets and let's get cracking by checking each and every colony from top to bottom.

Start by removing the lid and inner cover and look for small hive beetles (SHBs). Populations have been on the increase during the Summer months, hence some colonies may have more than they can handle. If you see these little black devils scurrying about, placing traps in your colony may be the way to go. There are several on the market and available through the bee supply companies. We've tried them all and have had the best success with the Beetle Jail Jr. (plastic, three-chambered reservoir, which snaps onto the top

bars) and the Beetle Blaster (single chambered reservoir which rests between two frames). Fill them with oil but be careful not to fill them to the top. Only fill the reservoirs about half way, otherwise you may spill oil onto the bees when placing them into the hive and the oil will kill bees instantly. Since temperatures are still warm, beetles mainly keep to the outskirts of the hive, so place the traps where you see the most beetles. As temperatures begin to drop they will begin to migrate towards the cluster. But, for now, the majority of SHBs can be found in the upper supers, hiding in the corners and in-between frame parts. Just a word of caution: SHBs love frame spacers because they provide little pockets into which the beetles can disappear.

The next task is to assess the amount of honey stores. Depending on numerous factors, nectar flows can differ drastically from one apiary to the next. If flows were below par, or too much honey was taken at harvest, feeding must become a priority. Once the temperatures drop the bees won't be able to break cluster in order to collect the food. All the syrup in the world will be useless if the bees can't get to it. And think in terms of gallons when feeding. It has been my experience that five gallons of a 2:1 sugar solution (two parts sugar to one part water) will yield one full medium super (roughly 35 pounds) of stored food. Depending on your neck of the woods, this may not be enough. If you are unsure of how much honey is required to get a colony through Winter in your region, consult an experienced beekeeper in your area. The further north bees are kept, the more honey is required to survive the longer Winter. A word of caution: feeding at this time of year can be tricky, so be careful not to trigger robbing. A single drop of sugar syrup clinging to the side of a colony will attract attention, especially when nothing else is available. Once bees start robbing it becomes a feeding frenzy, with even strong colonies succumbing to the onslaught.

Moving into the brood chamber check the viability of the queen. How does her brood pattern look? Are there skipped/open cells? Do you see any supersedure cells? If the pattern is spotty and the colony population is weaker than most, you may want to look for other problems first, such as disease or mite infestation before automatically assuming that there



are queen issues. However, the queen could be old, poorly mated, or not properly reared. If you determine that the queen is past her prime, late Summer to Fall is a great time to requeen, especially when accompanied by a flow, which is just around the corner.

Goldenrod blooms in North Georgia during September and moves south, with the Piedmont region usually experiencing a pollen flow by early October. So far, there's good ground moisture in place and plenty of sunshine, so goldenrod could mimic the Spring bloom, and be phenomenal. In years past, drought prior to, or excessive rain during the bloom meant minimal amounts of late-season pollen. Since adequate amounts of pollen must be available in order to produce winter bees (which we'll explore in a minute), check the pollen supplies. If pollen stores are lacking you may not want to wait for the fall pollen, just in case it doesn't materialize. Pollen patties are simple and easy to install and can be purchased already mixed together or in powder form. You may want to try several to see which you prefer. Another word of caution: SHBs love pollen patties. If you are seeing SHBs, portion out the pollen patties in stages (a ¼ or ½ patty at a time) otherwise they remain in the hive too long and the beetles will oviposit into them.

If by chance you can't acquire another queen, and the colony is weak, your best bet is to combine the colony with a strong one or one needing a boost. Weak colonies rarely survive the winter, so there's no sense in allowing the colony to limp along when you could have spared the bees and equipment from eventual disaster.

Next, examine the brood area for disease. You want to see healthy, white larva in the cells. Also, look for depressed cappings or ones with holes. Open these and inspect the pupae. Anything slightly off-color may be a sign of trouble (unless the pupa is in its later stage of development). Again, if you are unsure about what may be ailing your colony, consult a professional for diagnosis and treatment options.

Another late Summer chore is to inspect your equipment. Move frames with old comb to the outer edge so that they can be removed in the Spring and replaced with new foundation. Old comb is a reservoir for numerous contaminants, which can be detrimental to the developing brood and should be removed every three years. Replace old, decrepit hive bodies, supers, lids, inner covers and bottom boards with newer equipment. Bee hives don't have to be pristine little palaces; however, they do need to protect the bees from the upcoming frigid Winter weather. Gaping holes and cracks allow access for critters to come and go. Mice especially love to make their Winter homes in a beehive. A continual food supply, plus a warm cozy environment, make hives a suitable rodent dwelling. Structurally tight equipment and mouse guards discourage these unwanted guests.

Queen issues, food supplies, disease, and bad equipment are all things that need to be addressed before the arctic air descends upon us. Yet, there is still one more thing that we must not overlook: *Varroa* mites. By the end of Summer, mite populations may be skyrocketing. Please don't wait until your colonies are crashing. Once the downward spiral begins, it is almost impossible for them to recover. Check those mite populations today. Not only is it important to get their numbers under control for the existing bees, but also for the future bees that will bring the colony into the New Year. I'll get back to the importance of reducing mite populations, but first let's talk about these future bees.

The average lifespan of honey bees varies considerably based on the season when they emerge. These variations have been designated into two groups of bees dubbed Summer bees and Winter bees. Summer bees live approximately one month, while Winter bees can live anywhere from six to eight months. Winter bees emerge during August or September, depending on location, and differ from Summer bees by several physiological characteristics. Scientists have determined that the lifespan of

honey bees can largely be determined by the amount of protein stored in the fat body, hemolymph, and hypopharyngeal glands. The most notable and scientifically relevant type of protein is the high-density glycolipoprotein vitellogenin. It is loosely described as a female-specific, hemolymph storage protein, or more specifically, an egg yolk protein precursor. However, since worker bees rarely lay eggs, this protein is stored in fat bodies for future use. The relevance of this specific protein is largely based on its abundance in honey bee hemolymph as well as its high zinc concentration which regulates many functions within the honey bee. Vitellogenin is also thought to be a powerful antioxidant which significantly slows the effects of aging.

Now, getting back to the importance of reducing mite populations. Higher mite populations at the end of Summer or early Fall coincide with the production of these Winter bees. Research has shown that mite infestation during the pupal stage has a negative impact on the bees because they are unable to accumulate the necessary hemolymph proteins, including vitellogenin, to the same extent as non-infested bees, thus reducing their ability to overwinter. In order for the colony to have a chance of overwintering successfully it is imperative to reduce mite levels *before* the production of these Winter bees. And to step back even further, *the bees rearing the Winter bees* need the proper nutrition and development as well. They must be healthy enough to rear the Winter bees, and the bees rearing those bees need to be healthy, and so on.

Re-queening, appraising honey and pollen stores, checking for mites and disease, inspecting equipment while keeping robbing at bay will only help the colonies do what they do best. By storing honey for energy and pollen for protein, European bees have evolved to survive long Winters. But unfortunately, with introduced exotic parasites, diseases, viruses and a whole host of other non-indigenous problems, "we" have thrown this whole process out of kilter. Now "we" must be better stewards of our bees or face the consequences of finding more and more of our hives devoid of life. BC

Jennifer Berry is the Research Coordinator at the University of GA Bee lab. Contact her at ***Jennifer@BeeCulture.com****.*

THERE'S MICE . . .

Some useful tips to help avoid this pesky critter.

Ross **Conrad**

September in the Northeast . . . shorter days, crisp cool nights, the colorful tapestry of Autumn leaves, and the smell of smoke from the wood stove mixing with the musty dampness of the Autumn rains all hint of the cold Winter season to come. For beekeepers in the Northeast, this is a busy season. Time is marching on and any honey harvesting and extracting that has not yet been completed becomes more difficult. The bees and the weather both take their toll on the procrastinating beekeeper who has not gotten these chores completed. As the bees find less and less to forage on, they become more defensive of their stored honey and quick to jump on the opportunity to steal unprotected or exposed honey. Meanwhile, the growing cold seeps into the combs, thickening the honey and making it slow to leave the cells as it spins round and round in the extractor.

This is the time in the Northeast when the wildlife are making preparations for Winter survival. In many ways, the bees have been preparing for winter for much of the year. Their instinctual hoarding instinct to collect and store as much honey as possible in their hive throughout the Spring, Summer and Autumn is due to the colony's primary challenge; surviving the Winter. Once the harvesting is complete and the *Varroa* mite issue has been addressed, it's time for the beekeeper to do his/her part to help the bees prepare for Winter.

An important though often overlooked part of the northeastern beekeeper's Winter preparation is dealing effectively with mice. If you have ever lived in an old farm house, you know that the walls tend to come alive with the sound of little scampering feet at this time of year. Mice find their way into small cracks and openings in the walls that allow them to explore the structure of the house with an eye toward building a Winter nest. A hive of honey bees is also an attractive overwintering site for mice. Not only does it provide protection from severe weather and the additional warmth that the cluster of bees emit throughout the winter, but there are ample food stores everywhere they turn within the hive! Honey, pollen, and even the wax combs themselves all are appetizing to a hungry mouse. Mice are not quite as much of a problem down South where winters are not as long and cold, but in the northern reaches of the United States it is good to take the threat posed by mice into account if you want to prevent damage to combs and wooden ware.

Some commercial beekeepers will place a small amount of poison kibbles under each hive for mice to find. This approach is quick and effective. However, besides being less than humane this approach has a few major drawbacks. Other critters such as cats or dogs can potentially find the poison bait under the hives as easily as the mice can, the regular purchase of poison on a yearly basis is a drain on profits, and the constant reliance on an input that the beekeeper is unable to provide for themselves makes their operation less sustainable.

You may benefit if there are rock walls, wooded areas, and other places that make good habitat for snakes in and around your apiary. Many snakes will happily make a meal out of any mouse they come across that they can fit into their mouth. However, in places like Florida, extra care must be taken because many of the snakes are venomous and like to hide underneath the beehives. They can provide quite a surprise to anyone who carelessly reaches underneath a hive without first making sure the area is unoccupied.

When employing the service of snakes to help keep the mouse population in check around your beeyard, keep a sharp eye out when mowing the grass within the apiary. It is not uncommon to scare a snake that had been hiding amongst the hives and have it duck into the bottom entrance of a nearby beehive in an effort to escape the mower. Such an unfortunate snake is likely to exit such a hive shortly after looking like a porcupine, bristling with freshly laid stingers throbbing and pulsing all along the length of its back. A snake that receives such treatment does not live very long.

Rather than kill mice or rely on snakes, it is a simple matter to fit a piece of half-inch hardware cloth over the entrance by the bottom board. The holes in half-inch hardware cloth provide plenty of room for the bees to come and go, but are not big enough for the mice to fit through. I prefer to use hardware cloth over other ways of reducing the entrance area to restrict mice, since it does not interfere with air circulation within the hive and aids the colony in venting out moisture from condensation and respiration during the Winter

Since mice don't move into a beehive until the bees have formed their cluster and are not monitoring and protecting the entire interior of the hive regularly, installing a mouse excluder on a hive is best done *before* the cluster is formed. Should a busy schedule prevent

timely installation, a mouse guard can be applied on any warm day when the bees are flying. If the temperatures are warm enough for the bees to fly, then they are likely warm enough for the bees to have broken out of their cluster and begin patrolling the entire cavity that surrounds the colony causing the mice to leave temporarily. Install your mouse guard before the temperatures drop and the mice return, and you will succeed in barring them from the hive. Install your mouse guard on a day when it is cold and the bees are clustered, and you may end up locking a mouse *inside* the hive. Not the best situation for anyone involved!

It also helps to keep your bee equipment in reasonably good condition. Ancient beekeeping equipment that is falling apart, missing pieces, and/or rotting away is difficult to seal up in order to prevent the admittance of mice. Replacing old unsound equipment during the spring inspection, or while reversing the hive, will go far

. . . And There's Deer Mice

Deer mice are hard to dislike, until you find the mess they can make.

Dan **Stiles**

I discovered recently that the half dozen baseball caps I'd collected over the years and hung together on a set of deer antlers were chewed up and ruined. In recent months, unbeknownst to me, my caps had become a multifamily nest and bathroom for several generations of deer mice. These appealing looking creatures have caused a whole lot of trouble out here in rural West Virginia!

For instance, almost every time I light the outside gas grill, I have to remove a handful of dry, mostly grassy mouse nest material, along with its frustrated builder. And, deer mice also love to build nests on any kind of engine. My lawnmower, stored in the barn for a week or more, is 100% guaranteed to have a mouse nest within the engine's intricacies. My routine before starting the engine is to check the oil level, fill the gas tank and remove the mouse nest.

When I was studying wildlife management 50+ years ago, we students set several dozen mouse traps in a variety of promising looking mouse habitats. The next morning we had a surprising number of creatures that represented a half dozen species, including deer mice, house mice, meadow voles, jumping mice, pine voles, and miscellaneous shrews and moles. The lesson I never forgot, and most people don't realize, is that in the night there are likely to be wild animals on the prowl outside their home and apiary – lots of them.

The truth be known, deer mice are hard to really dislike, especially when you look at them closely. There is something appealing and comical about their bulging eyes and large ears. They must have gotten their name from their color – brown fur above and white below, just like a miniature white-tailed deer.

In the Fall and Wintertime when honey bees are clustered to generate and share warmth, deer mice can become a serious problem for beekeepers. They climb inside the hive through the bee's entrance and build a nest, often in the far corner, but sometimes within the middle of the wax foundations. What a luxurious life for a mouse family! Shelter from the wind, snow and predators, plenty of heat and an abundance of dead bees, bee's wax and honey to dine on. You can bet there are plenty of mice in and around most apiaries that would love to spend the cold weather months nestled close to a cluster of honey bees. And, what an awful mess they do make!

I have had to admire the courage of deer mouse mothers. Their hairless, red, blind, helpless youngsters within the nests that I remove from my gas grill, various engines and occasionally from within a beehive, are almost certain to be rescued. I just place the nest carefully on the ground off to one side, and within minutes the fearless

in keeping your colonies weather and rodent proof.

To reduce mouse issues it also helps to keep the area in and around your beeyard neat and tidy. Piles of debris, old junk supers, broken frames of comb, and tall uncut vegetation, all help to create a habitat conducive to a thriving mouse population.

Don't let all the action at the hive entrance distract you from what may be happening behind the front lines in this battle against the mice either. Those empty honey supers, full of frames that the bees worked into drawn comb that you have extracted can be very attractive accommodations for a mouse. Prevention is the first line of defense, utilizing barriers and good housekeeping for a pest-free honey house and extracting area. Control can always come later if preventive measures are unsuccessful.

Just like the hive itself, prevention starts with a solid building. Inside, consider stacking supers kept in storage on top of one another, with the bottom super sitting on a flat surface, and use something mouse proof like an outer cover to seal up the top of the pile. Be sure to keep the stack straight, with each super lined up directly on top of the one below. It takes only one askew box in the pile to create a large enough opening for a mouse to squeeze through.

If preventive measures fail or additional peace of mind is required, the assistance of some traps or the employment of a cat or two can be useful around the honey house or equipment storage areas. However, both these approaches tend to work slowly and may allow for some damage to occur before all the mice have been removed from the area. Whatever your approach to controlling damage from mice, now is the time to act. BC

Ross Conrad is the author of Natural Beekeeping. *You can reach him at* ***dancingbeegardens@hotmail.com.***

old girl with a businesslike air will appear and carry away (in her mouth) each of her offspring to an alternate nest site – one after another.

The trouble with mice nesting on engines is that they tend to gnaw the insulation from electrical wires when they get hungry – or maybe bored. My radial arm saw tripped its circuit breaker recently – mice had chewed the insulation off wires in the vicinity of their nest, leaving a twisted bundle of gleaming copper strands. And, a single spark within the combustible nest material might well have caused a fire.

The trouble with deer mice getting into a hive is that they tunnel through and destroy many of the foundations, particularly in the bottom brood box. They carry in handfuls of loose, dry nest material as well as nuts, seeds, and berries that are scattered throughout their tunnels. And worst of all, their considerable accumulation of urine and excrement within the hive is an abhorrent sight – so contrary to the neatness and cleanliness beekeepers strive for. And, very seriously now, everyone should be aware that their urine and feces are known to carry a number of very serious diseases!

We all know that deer mice are extraordinarily prolific. A female mouse just six weeks old can produce her first litter consisting of four or five youngsters. She is capable of producing two or three more litters that same year. Thus, when there is ample food and shelter, and few predators, their population can build to tremendous numbers in a hurry.

Deer mice are most active at night. They swim well, can jump a foot high (probably more), and climb up rough (like brick) vertical surfaces with ease. Their hearing and sense of smell are good but their eyesight is not. It's interesting to note that mice live all their lives without drinking water – they manage to get sufficient moisture from the food they consume. And, they live longer than you might expect – three years is not unusual for a lucky mouse.

Beekeepers have come to realize that any dime size or larger hole in a hive is an open invitation to mice. The bare skull of a deer mouse is about 10 to 12 millimeters or roughly 1/2 of an inch wide. So, either metal mouse guards or four mesh per inch galvanized "hardware cloth" stapled over entrances to the hive are the tried and proven manner of excluding deer mice (and their rodent relatives) from entering. Boiling these measurements down to common sense essentials, if you can wiggle your little finger through an opening in your hive, a mouse can wiggle through too.

Hawks, owls, foxes, cats, coyotes, weasels, and snakes help keep deer mice numbers in check, but indoors or where predators are scarce, mice are easy to "snap" trap. The trick that works for me is to bait the trap(s) with smooth peanut butter. Smear a very small amount of it on the trap's triggering mechanism, and place the trap where mice can get to it with minimal exposure to predators – dark places preferably with some sort of overhead cover. And, if you screw down the wooden based snap trap to a larger board, the energy of the trap's Spring is enhanced, it closes quicker and the trap will never be lost.

Anyone can manage habitat to increase wild animal numbers. And, anyone can also practice what I term reverse wildlife management to reduce wildlife populations. Mice hate open spaces with no place to hide, so whatever steps that can be reasonably taken to remove food, cover and concealment for rodents will pay long term dividends.

By now I'll bet you can guess the wild mammal that is believed to be the most numerous in our entire nation. I know we have way more than our share of them out here in wild, wonderful West Virginia. BC

Dan Stiles is a retired wildlife biologist in West Virginia.

TALKING TO KIDS

A few tips for talking to kids

David **Baumbauer**

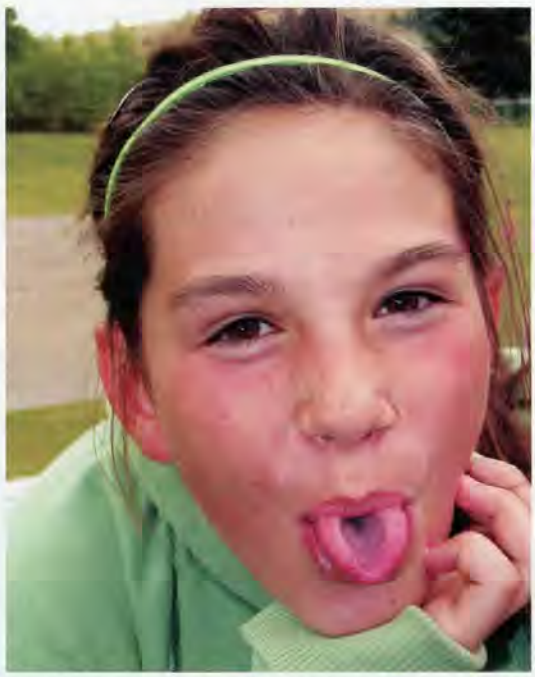
The public is eager to learn about honey bees, pollination, and the current state of Colony Collapse Disorder. Once word gets out that you are a beekeeper, the requests for presentations and demonstrations will soon follow. Honey bees and beekeepers need all the friends they can get, so you should commit to giving a few talks. Over the past six years, I've presented on honey bees and beekeeping to all ages of school groups, garden clubs, Master Gardener Training, and on the local PBS station. The following tips might be helpful when you put together your next presentation.

To Bee or Not to Bee?

Once you agree to give a presentation, the first logistical decision to make is whether or not to bring live bees. If you have a small observation hive set up, the challenge of taking bees on the road is simplified. I've built a one frame carrier from Dr. James Tew's plans that allows for the safe transport and viewing of a single frame of bees. I'm careful not to take the queen and to minimize the amount of time the frame is out of the hive. Having a large group view an observation hive takes time, as only three or four people at a time get a close look at the action. One way to address this is to create stations, but this takes multiple presenters. Weather is always a challenge, so many times it is not practical to bring live bees along because it's too hot, or cold.

What, No Bees?

While having live bees at a presentation makes for good viewing, they are not required for a fun and educational experience. I bring a set of study prints illustrating the different honey bee castes, life stages, and activities such as pollen and nectar collection. You can find the study prints at most bee supply firms; get them laminated and they are then durable enough to pass around the room. Make sure the set you have has a photo of a cross section of comb in the brood nest illustrating the lifecycle



from egg through pupae. It is an impressive photograph, which is far more powerful than the typical chart found in most bee books. Don't forget to bring along an empty hive, smoker and protective clothing. Kids are quick to volunteer and model a suit and veil.

For the last two years, I've participated in a local middle school's "Outdoor Camp." Groups of 20-25 students rotate through the one hour long stations, which cover a wide range of environmental education topics. Due to the time of year (this year's camp featured six inches of snow on the ground), I have not been able to bring live bees along. I had to come up with something educational and entertaining for sixth graders indoors!

The social life of honey bees captivates the middle school audience since they themselves are going through the process of determining their place in the social structure of school. Combined with the hormonal surges of adolescence, your middle school audience is keen to learn about pheromones, waggle dances, mating flights, and other colony activities. Nothing drives home a point like audience participation, so set your pride aside for a minute and get everyone up and waggle dancing. Explain how bees use the sun angle to determine direction to a nectar source and the length of the dance to determine distance. Yes, you are taking a certain amount of 'poetic license' since people are limited to dancing on horizontal surfaces and bees are not. Despite taking a few liberties, your audience will appreciate the wonder of honey bees communicating distance and direction through dance. Other audience participation activities include: Fanning

pheromones and using antenna (hands) to communicate with their neighbors. Find out who in the group can roll their tongue up and transfer nectar. Select a 'Queen' (girls or boys may apply), and demonstrate how the queen stays warm all Winter by workers clustering around her and vibrating, or shivering their muscles.

Honey Tasting Makes Everything Sweet

Even with the above mentioned audience participation, an hour is a long time for school kids to pay attention. Take a break mid-way through and have a honey tasting. If you have access to different varieties of honey, small samples on a little piece of bread offers up a great opportunity to talk about beekeeping around the country and how nectar is turned into honey. At the Outdoor Camp, my wife and I combine Dutch Oven cooking with the beekeeping demonstration. While I'm talking and dancing, Cathy has mini-biscuits baking in the Dutch Ovens. I'm sure our popularity is mostly due to warm biscuits drizzled with honey. An adult helper controls the squeeze bottle of honey, minimizing the mess potential. This is a good time to discuss the challenges of migratory beekeepers and their role in growing our food.

What is Happening to the Bees?

Given the media attention of Colony Collapse Disorder (CCD), there will likely be many questions. It is a complex situation that is difficult to explain, but the best analogy I've heard compares CCD to the game 'Jenga.' For those not familiar with 'Jenga', the game consists of a tower of wooden blocks. Each player takes a turn removing a block until the tower collapses. Have your audience imagine that each block is labeled with one of the many challenges facing honey bees: Mites, viruses, Nosema, nutrition, pesticides . . . . You can explain that the challenges are connected, and that we are trying to figure out what the best management practices are to keep honey bees healthy. Be ready with some suggestions on how folks can help honey bees, as young people want to get involved. Planting pollinator gardens, buying American honey, reducing pesticide use around the yard and garden are but a few action items for your audience. Have publicity for the local beekeepers association or beginners workshop available in case you have a prospective beekeeper in the crowd.

The Take Home Message

Your audience should leave with a better understanding of what goes on inside a beehive, the relationship between the keeper and their bees, and the ecological and economical importance of honey bees. By adding in audience participation your are also ensuring that it was a fun and memorable event. BC

The author and his daughters dance with bees in Bozeman, MT. He can be reached at beekeeping@montana.edu.

SHOW TIME

Bob Maurer

October 28-30, 2010 – London

In my last article I told you a bit about the history of Britain's National Honey Show; the largest honey show in UK. Our aim is to be the 'gold standard' honey show and we have entries from all over the world. So what will the show be like this year? Our current home is a college in Weybridge, about 20 miles south of central London. Set up work starts a couple of days before the official opening. Exhibitors bring their entries (usually well over 1,000 of them) for staging on Wednesday afternoon, judging takes place on Thursday morning and the show is opened to members and to the public on Thursday afternoon.

However, there's much more to the show than the show bench. A series of lectures are held with eminent speakers from all over the world. This year one of them will be a certain Mr. Flottum from USA – perhaps you have heard of him! For those who want to get their hands dirty there is a very popular series of workshops on many different subjects – candle making and cosmetics are always booked up well in advance. There is a trade area where you can buy beekeeping equipment, books, bee related gifts, mead and much more. An excellent cafe satisfies the needs of the inner person.

The National Honey Show is run as a company limited by guarantee and is a registered charity. It is managed by a council and a variety of sub-committees – all unpaid volunteers. At show time, a small army of helpers is recruited, judges are appointed, stewards are allocated and most things run like clockwork.

Behind the scenes the show is used as a venue for a number of meetings of beekeeping administrative bodies such as the Confederation of National Beekeeping Associations and in the evenings the show is the backdrop for a variety of charity events – The charity Bees for Development is one of the regulars. It makes sense to hold these meetings during the show as all the great and the good in beekeeping are gathered together in one place.

The show closes on Saturday with a presentation of the vast array of cups and trophies that the show has accumulated over the years. These are displayed in the show area on Saturday and make a spectacular sight. An engraver sets up his workshop at the show each year so by the time the presentations are made the winners name is already on the trophy.

If you would like to read more about the National Honey Show have a look at the website www.honeyshow.co.uk. How about coming over to visit? Why not bring some exhibits? It can be a bit of a handful getting honey exhibits through customs but it's not impossible. The show schedule will soon be available on the website and to give you an immediate idea of the classes, the schedule from 2009 is still available. See you there! BC

TOP BAR HIVES

In A Washington Prison

Daniel **Travatte**

This program is beneficial on a lot of levels for a lot of people.

Cedar Creek Corrections Center in Littlerock, Washington is a minimum security prison that houses approximately 500 inmates. The superintendent of the facility, Mrs. Hisami Yoshida, is dedicated to making the institution more eco-friendly by supporting many "green" programs, one of which is beekeeping. Beekeeping is a unique program for prisoners to be involved in, as I am unaware of any other prisons that have a program to the scale in which we have (Stafford Creek Corrections Center in Aberdeen just started up a small bee program modeled on ours). Cedar Creek has increased the size of our beekeeping program by partnering with The Evergreen State College. This partnership provided the prison with a biologist to teach us the biology side of beekeeping and scientific method. I have been caring for the bees since my arrival here almost three years ago. The involvement of the biologist and the addition of the new colonies that were brought in this year have been an excellent learning experience for me. I had never kept bees before coming to prison. I've found it both educational, and fascinating, satisfying work.

I was primarily trained by one of the correctional counselors, Vicki Briggs, by caring for the three hives we had before the partnership with the college. She is a hobby beekeeper herself and as a counselor here she became the staff member who managed the bees. We made some splits in the Spring with the two colonies that survived the Winter and had a total of eight colonies. One of our colonies had an extremely prolific queen. We also had been making lotion and lip balm products with the wax from the hives here.

When Evergreen arrived they brought in an additional 21 colonies (in four frame nucs). Ten interested inmates that signed up were included in the two day a week class held by the Biologist Sam Hapke. We were taught the technical aspects of beekeeping and a lot of bee biology. We learned how to graft, check for *Varroa destructor*, and check for tracheal mites with a microscope. We also learned many treatment strategies for these parasites both chemical and non-chemical. However, in practice we only used the non-chemical techniques. We also started taking comb measurements, extensive field notes, and ran experiments with Kenyan top-bar hives. Since top-bar hives are not easily found for purchase they were made here by inmates in the maintenance shops. Actually almost everything we use in the bee program here is made at the prison by inmates including the more common Langstroth hives. We still have a large amount of those types of colonies. We will be comparing Winter survival in these versus the bar hives.

We started this Spring installing three packages into three new top bar hives. One took, but the other two died, we're not sure why. Just a bunch of bodies left behind. Next we installed a colony from a nuc in the traditional manner into a bar hive. They absconded promptly within a day. Nothing was left behind except two bars with approximately 40 square inches of empty comb they had built during their short stay. They also left only a few bodies. Of these four installations only one could be considered a success and it was slow going at first. However, this first colony now has over 20 bars of comb built out and is doing very well. When the additional colonies were brought in by Evergreen, we installed five more colonies into bar hives. After our experience with the last nuc we installed into a bar hive in the traditional manner. We decided it was best to move a frame of brood into the new hive to give the bees a vested interest in staying around, since their strongest instinct is to nurture their brood. Usually you don't transfer brood to a bar hive because the Langstroth frames don't fit in the same space as the top bars. The bees usually need to start from scratch building comb on nothing but a strip of wax starter in the grooves of the bars.

The bees are then supposed to get the hint from the wax in the grooves of the bars to build there.

In addition, we made sure they were heavily fed 1:1 sugar syrup every week even during the nectar flow. This was for several reasons; to help entice them to stick around and to give them what they needed to help them build their comb. No pre-built comb from last season, no foundation other than a small strip instead of the

Traditional bar configuration on a Kenyan top-bar hive.

Comb added to a foundation start strip.

wax in every other third bar. This was for the purpose of experimentation to find out what the bees would prefer to build on.

To install the frame of brood from the nuc was tricky because the frames did not fit in the bar hive with the regular bars. So we just placed it leaning against the wall in the bottom of the hive. The bees then began to build lots of erratic parallel comb. After a week of this we made hanger boards and installed the bars and Langstroth comb in a new configuration.

After arranging the hives in this new configuration the colonies stopped building erratically and started building where they were supposed to. In addition, they were staying put and not taking off or dying. Every week we took precise measurements of all the comb built on the bars with a grid printed on a transparency and recorded everything in field notebooks. We kept track of exactly how many inches of comb were on a given bar and what position it had been in. We kept track of the movement of all bar positions and what the comb was being used for as well, ie: pollen, brood, nectar, etc.

Also, we have made extensive notes on all of the colonies whenever we worked a particular hive. We would note how well the colony was building up, how aggressive the bees were being, and how well they were holding up to invasion by wasps and bald face hornets. We had a particularly bad time with wasp and hornet invasions this year; we lost a couple of bar hive colonies because of this. The first sign a colony was going to abscond was they would stop laying, stop storing nectar and pollen, and the comb would start to empty out. Then they would all just take off. Nothing would be left behind but empty comb. This was suicide for the bees this late in the season (this happened in late August), but apparently they felt they would not have made it if they stayed. I had never seen so many of these predator insects after our bees. The prison is in the middle of the woods in SW Washington State so there is a lot of habitat for these types of insects.

Measuring the comb in the bar hives.

We found that bees kept in bar hives were much less defensive than those kept in Langstroth hives. The bees also seemed to have a more difficult time defending the bar hives, probably because of the larger area inside not occupied by comb or foundation. We had to make specialized entrance reducers by drilling eight, 5/16th inch holes in a six inch piece of a 1" x 2", and mounting that over the entrances. This seemed to help a lot. We also purchased some yellowjacket traps and placed them all around the apiary. This helped to reduce the yellowjacket numbers a great deal. These traps lured the yellowjackets in with an attractant specific to them, not a single honey bee was trapped. However the traps did not work on the bald faced hornets so we spent considerable time manually squashing them every day we were out in the apiary. Eventually, I made some traps out of plastic pop and water bottles and baited them with tuna juice. This worked to lure in all the predator insects and again did not attract honey bees. In hindsight, traps should have been put out sooner.

We also found that the bar hives caused the bees to become markedly more gentle. What was a nasty colony in a Langstroth hive would become gentle overnight after installation in a bar hive. We were able to work the bar hive colonies easily without a veil or smoke. This is probably one of the reasons these types of hives are used in Kenya where they are working with Africanized bees. When opening up one of these hives you usually only pull one bar out at a time. The top of the hive stays relatively closed with only one bar pulled. This is less intrusive to the bees when only one small part of the top is open rather than the whole top being opened up like in a Langstroth hive. This is why I believe they act less defensively.

For feeding the bar hive colonies we started by simply placing a feeder bag on top of the bars. After several weeks of this I found it was quite wasteful, we had a lot of empty Zip-Loc Bags to dispose of. So I obtained a quantity of #10 tin cans from the facility kitchen and placed them in the back of the bar hives past the divider. This made feeding much simpler and less wasteful, just top the can off with syrup and close the colony back up. We would throw a bunch of scrap wood pieces and a screen from a bee package in the can to give the bees something to crawl out on. This worked beautifully.

This program benefits the community in whole, but especially the bee community because we are able to spend more time making observations for the biologist and for articles such as this one. The inmates benefit greatly by learning something new and we have something positive to discuss with one another while incarcerated. The Department of Corrections benefits by providing programming for the inmates and production of bee products for use here in the kitchen and for other programs. The Evergreen State College benefits by gathering data and experience for their graduate students. Therefore, everyone benefits from these programs by working together to meet their needs with less cost to the taxpayers. BC

SURVIVING IPM

One beekeeper's journey from the garden to the brink of insanity.

Gwen **Rosenberg**

Despite all the good intentions, the workshops, the speakers and the lingering guilt, I have never really treated for diseases or mites. I've been practicing my own sort of the "Live and let die" philosophy, only there has been significantly far more bees dying than living. Righteously, I chalked up this inefficiency to my holier, more organic, more integrated pest management minded style. In reality, my lack of treatment or prevention has been more a product of neglect than a passion for reducing my chemical footprint. So far, "going green" and "eco-friendly" have been convenient covers for me to avoid investing a lot of time or thought into the hives that have so far squeaked by on sporadic feedings of sugar syrup. I've easily rationalized my busy schedule with kids, pets, and assorted side projects as good enough excuse to avoid getting serious about making honey from healthy bees.

Farm Markets are good for you, hard on your budget.

This year, Michelle Obama's organic gardening campaign, coupled with my bee club's insatiable appetite for IPM methods and experts, made me reevaluate my sorry beekeeping practices, and whip myself, my bees and my entire family into organic, IPM style healthfulness. This is the story of how I completely, fantastically and almost catastrophically, failed.

Lately, I have enjoyed a new and exciting hobby of raising fruit trees. After scouring volumes of Ohio State Extension bulletins I came to the realization the IPM is here to stay. In the beeyard, in the garden, and in the house, I was going to scout out diseases and pests, and use all the cultural and biological controls before I even considered chemicals. So count me on board this bandwagon!

My first encounter with disease was my neighbor's quince tree which was riddled with fire blight from last season. I simply cut back all the diseased branches 12 inches beyond the infection – just like the book said. No problem – O, this IPM thing was a piece of cake. I was smug with the satisfaction of not spraying more chemicals on our polluted planet. Almost immediately, I got a sinus infection and a 10 day course of antibiotics.

Not to be discouraged, I realized the need for better nutrition for my bees, garden and family. If we all ate better, bees included, then we would be more resistant to disease. Clearly that's why I was stricken with the sinus infection and subsequent antibiotic induced . . . shall we say "nosema." The bees got pollen patties, the kids got whole grain bread and hot tea with lemon juice for their sore throats. I ate a lot more yogurt. Every meal contained remarkably expensive organic produce from the local farmers market. I wish I could say that the kids relished the kolerabi and beets, and were devastated when I came to realize I could no longer afford to feed them strictly local, organic, produce, but that wasn't exactly their reaction. No matter, the gasoline footprint left by transporting eight dollars worth of mesclun mix, was too great a price anyway. Besides, what's more local than my own backyard?

The 17-year old garden center employee informed me that due to the amount of nitrogen from last year's horse manure, I would need triple strength phosphorous. I don't know if phosphorous is organic- the label just had the word phosphorous written on it. Does Michelle Obama do all this herself? I'm beginning to think she has more than Summer help from the garden center to guide her.

The garden was planted, and the standard of nutrition was raised, so now I could focus on disease/pest prevention. Prevention is the phrase for IPM. My yard had more prevention that actual edible food. The fruit trees in the backyard got no less than five traps and de-

terrents each hanging from the branches. The view from the patio reminded me of the Charlie Brown Christmas special with the lame little Christmas tree adorned with odd looking homemade ornaments. Only in my case, the ornaments were loaded with pheromones; apple maggot traps, pear physlla traps, peach tree borer traps, deer repellent, and coddling moth lures, not to mention trunk guards and wraps. I inspected the leaves every day scouting for disease and insects. I found one tarnished plant bug and some aphids. The trees looked great. I installed some bluebird boxes to encourage natural pest control, and I had not killed a single beneficial wasp with chemical spray. I was really doing it – I was a responsible citizen of planet earth! The drone comb I cheerfully placed in the hives indicated that my bees were satisfactorily controlling *Varroa*. The alert level was well below my economic/action threshold. I patted myself on the back for being such a clever organic, beekeeper and gardener.

My children and I on the other hand, were being sprayed down with antibiotics. It was child number two who first surpassed my action threshold when he woke up screaming in the middle of the night. Strep throat. Despite my new organic lifestyle (except for the fact that I was still on meds for the sinus infection), he would need a doctor to avoid rheumatic fever. The doctor ordered a CATScan and we spent two restless nights in the hospital because he had an abscess in one of his tonsils. He spent 14 days on an extra strength antibiotic. When the doctor and I had a conversation over his bed regarding the possible need for a tonsillectomy, I couldn't help but think of the quince tree with fire blight, and the significantly less expensive pruning options available in this case.

Back at home, I was still committed to raising my hives and garden successfully even if the gods of IPM were mocking me. While I was smearing the cabbage moth eggs off of the cabbage leaves by hand, I was distracted by my dog's incessant scratching. Garlic powder, while tasty on dog food, does little to actually prevent flea infestations- thank you very much internet-organic-pet-care-advice-forum. He needed a blood test for heart worm, and the vet found a tick the size of a marble on his ear. Later that day, as I doused the dog with pesticides in the driveway, a house sparrow flew from his family home in the bluebird box and ate two of the four cherries that had managed, somehow, to grow pesticide-free on the cherry tree. I made a mental note that next year I would use some bird netting, or perhaps invest in one of those scary looking fake owls.

With the entire cherry harvest obliterated, I focused on the raspberries. They were growing by the bushels, they were growing so well in fact, that they had outgrown their intended purpose of acting as a foliage corral for the bees and now were closer to becoming a foliage noose around the angry, shaded hives. Before I could thin out their ranks, however, my first born staggered home with a fever closing in on 102° and strep throat. I thought of how I could have missed this infection, and my mind wandered to tracheal mites. I suppose I could have inspected in the same gory manner, by popping off his head and peering into his throat, but it was too late now, we were off to the pediatrician again, for some chemical intervention and blood tests.

Back in the beeyard, while checking the sticky board for *Varroa*, after I had erroneously forgotten to take out the drone comb before it hatched releasing a flood of mites on the foragers, I noticed a rustling in the raspberries. It was a neighbor kid who I now realized has been in my house and yard for the past four days. His mother, more interested in her personal time than mine, had let him wander over some time ago. He picked the remaining red raspberries, and mindlessly walked through the garden crushing tomato plants as he went. I could feel something deep in my psyche sort of give way. The line between complete frustration and insanity had come dangerously near as I scanned the garage for my sprayer and double checked every pesticide label for this particular nuisance pest. Luckily, the OSU bulletins were adamant about abiding by the label instructions on pesticides and his name wasn't clearly stated on the label, so I angrily shooed the little disease vector home to his thus far, healthy mother.

Maybe next year.

In all, my attempts to control disease and pests was an abysmal failure. My family has consumed enough antibiotics to warrant being placed on some drug resistant ground zero watch list. The kids have rioted against whole grains and romaine lettuce, and even the dog has a foul taste in his mouth from my half-baked flea prevention. The neighbor's tree erupted in more fire blight, and my own trees are irritated by constant ham-handed efforts to outsmart insects that are apparently much smarter than I gave them credit for. The traps trapped all sorts of things . . . beneficial, pest and in between. (Honestly, I can't tell what team the little bugs are playing on anyway.) There's blight and fungus everywhere, some powdery, some downy, some fire-y. Remarkably, bees are still flying and the kids and I are finally well enough to sit outside and eat cheeseburgers. The important thing isn't that we succeeded in living an organic lifestyle with responsible IPM practices- it's that we survived it! BC

Gwen Rosenberg raises bees, fruit trees, tomatoes, dogs, chickens and little boys at her home in Kent, Ohio.

URBAN BEES

Lori **Litchman**

Changing The Rules About Bees & Beekeeping Is A Challenge Worth The Work

Beyond the din of buses and cars and the bustle of metropolitan areas across the country, honey bees are quietly buzzing and feasting daily on a plethora of pollen and nectar.

And in more and more instances, the owners of these urban honey bees are no longer scofflaws, as city governments increasingly recognize the benefits of beekeeping by lifting bans or passing new laws.

"I am finding that my bees are having an easier time finding forage in the city," said Minnesota beekeeper Kathy Connelly. "There just isn't the succession of blooms that can sustain honey bees in many rural areas."

In fact, urban honey bee hives have been thriving, surviving what has become the bogyman of the beehive: Colony Collapse Disorder.

According to one expert – Dr. Elizabeth Capaldi Evans, Associate Professor of Biology and Animal Behavior at Bucknell University – urban hives and hobby hives in general have suffered fewer losses for three reasons.

First, a decreased exposure to pesticides in urban areas boosts the immunity of the insects from succumbing to the disorder. Second, urban beekeepers and hobbyists devote more time to the individual care of their hives, and can monitor the insects more closely for signs of disease. Finally, cities provide a smorgasbord of biodiversity in the types of flowers the honey bees pollinate.

But cities and municipalities across the country have been slow to see the benefits of urban beekeeping. In a recent survey, *Bee Culture* found that over 90 municipalities still ban beekeeping.

There have been positive signs, however, that the trend may be starting to turn in favor of beekeepers. In the past few years, a number of major cities have started to allow beekeeping, including the city of New York.

Beekeepers also see promise in the fact that First Lady, Michelle Obama, made sure to include a honey bee hive in her organic garden on the White House lawn.

So what do you have to do if you are keeping bees illegally? Here's a look at how beekeepers in several cities took action to come out of the shadows and keep bees legally.

The Model Ordinance

In June 2009, the Minneapolis City Council voted to lift the beekeeping ban that had been on the books for more than three decades.

The new law was supported unanimously by city council, likely due to the planning and educational efforts of the Minnesota Hobby Beekeepers Association.

Kris Miller, former president and current board member of the Minnesota Hobby Beekeepers Association said the organization stepped up to address a need.

Tom Theobald and Marygael Meister were strong advocates in getting the law changed in Denver. Marygael led the way on the change, then started the Denver Beekeepers Association.

"What was going on here in Minnesota was that there was a surging interest in beekeeping," Miller said, "and a number of municipalities didn't know what to do with bees. They are kind of livestock, but kind of not."

Kathy Connelly, who is an attorney, was on a committee of the MHBA when she offered to go online to see what else was out there with regard to ordinances and laws. She and the committee were able to come up with an "assortment of ordinances" and drafted a template that would work. The organization then shared the model ordinance with its members.

"We wanted to have on hand an ordinance that we could give to members and they could bring it to their city council members," Miller said.

City council didn't adopt the model ordinance

part and parcel, but it was helpful for beekeepers to have something substantive at their disposal.

It's important to point out that the MHBA is a 501(c)(3) non-profit organization, and as such can't lobby. But the organization can meet and dole out guidance to their members, which is exactly what it did.

The new law in Minnesota states that beekeepers must apply for a permit with the city's Animal Care and Control department. Once issued, the permit would detail the number and location of hives permitted. Beekeepers also have to pay $100 for the initial application and a $50 renewal fee every year thereafter. In addition, beekeepers need to fence their yards and get consent from 100 percent of immediate neighbors and 80 percent of landowners within 100 feet of the beekeeper's property.

Some say that the ordinance is strict.

"At least it's a step forward. In a few years, the city can revisit it," Miller said. "The people who really want to keep bees will work with it."

"The ordinance might make people pause for a moment and take a class so they know what they are doing."

Miller's advice to anyone seeking to legalize beekeeping is to find local beekeeping groups and experts at local universities who can educate people on the safety and benefits of beekeeping.

You can look at the model ordinance here: **http://www.ci.minneapolis.mn.us/**.

The Big Apple

Like Minneapolis, New York has seen an increased interest in beekeeping. The New York City Beekeepers Association and the city itself decided that the time was right to work together to lift the ban.

"We spent about two years gathering signatures for the petition and specifically sitting down with the Department of Health at their request to try to hammer out reasonable, safe, realistic guidelines and expectations," said Andrew Cote, president of NYCBA.

Before the lifting of the ban, honey bees were classified in the same category as tarantulas and cobras, all deemed too dangerous to live in the city.

In March of this year, the New York Department of Health and Mental Hygiene agreed to amend the health code to allow city residents to keep bees. Under the new law, all beekeepers will need to register their hives with the city, but won't need to have a special license or permit.

Cote said he initially had reservations about lifting the ban.

"Frankly, I personally was not in immediate favor of legalizing beekeeping in the city," Cote said. "I was and am afraid that it will attract reckless beekeeping."

"However, the tide was turning such that there were more positives than negatives in legalizing it, and we at the NYCBA were more than happy to be a part of the legalization effort and writing the safe practices and guidelines to make this happen in a responsible manner."

Cote said his advice for those keeping bees illegally would be to promote education and events that inform non-beekeepers and government representatives of the positive benefits of urban beekeeping.

Battling for Bees

The process wasn't initially so smooth in the city of Denver, particularly for beekeeper Marygael Meister. In June 2008, Meister was cited for keeping her bees and threatened with nearly a $1,000 fine and a year in jail if she didn't get rid of her hives.

Meister decided to take issue with the beekeeping ban. Meister lobbied city council and caught the attention of councilwoman Peggy Lehmann, who ultimately sponsored the bill to lift the beekeeping ban.

After nearly a five-hour hearing where Meister and others answered questions and concerns, the Denver City Council voted 10 to two to allow beekeeping in city limits.

Under the new ordinance, Denver beekeepers are allowed to have two hives on one property. Those hives need to be set up in the rear of the property at least five feet from the property line. The beekeepers also need to erect a six-foot high fence or other kind of barrier to encourage the bees to fly higher when coming and going from the hive.

In response to the new ordinance, Meister started the Denver Beekeepers Association to help educate urban beekeepers about the law and the best practices of beekeeping. When she first started the group she had about six participants. That number has since swelled to nearly a hundred now – **www.denverbee.org**.

Still Seeking Change

But with all of these successes, there are still battles being waged and beekeepers across the country looking to change the rules.

In Santa Monica, Daniel Salisbury has been lobbying the city council to convince them to lift the ban on beekeeping.

Salisbury, who calls himself an "amateur beekeeper," said he was unknowingly keeping bees illegally. Salisbury said he also realized that the current city law called for the killing of swarms of feral bees.

"I thought it was ridiculous that the city was exterminating bees and the farmers need the bees," Salisbury said.

So, he wrote a letter detailing what he thought needed to be done and sent it to all the members of council. He also sent a letter to the local newspaper.

In addition to legalizing beekeeping in Santa Monica, Salisbury has asked the city to create a beeyard where feral bees could be introduced to a commercial hive and eventually relocated to a farm in need of bees. Salisbury said he's successfully relocated about 50 hives to date.

The city council has agreed to study his proposal to see what is feasible for the city. Salisbury said that although there are still a few hurdles to overcome, there is support for his proposal.

Beekeepers in all of these cities agree that one thing is vital in legalizing bees: education. Everyone agrees that if you educate the public and municipalities about the need for bees in our environment and their vital role in pollination, you may have an easier time convincing them that beekeeping is safe and beneficial.

"We've come to rely on what the agricultural industry gives us," Meister said. "We are never at a loss for raspberries, blueberries, or avocados."

"We need pollination," she said. "If we like breathing and eating, we need to keep honey bees around." BC

Who Are The Beekeepers?

Wendy A. **Schweigert**
Larry **Krengel**

A comprehensive & sophisticated survey asks who we are and what we do.

Who are the people who spend time, energy, and money – let's not forget the money–maintaining homes for thousands upon thousands of stinging insects? Who are the beekeepers? Some characteristics are as you might expect, but some may surprise you.

In January 2010 we presented an invitation to complete a survey about beekeepers on over 30 beekeeping listserves as well as in *Bee Culture* and the *American Bee Journal*. Some then spread the invitation to local beekeeping groups. We were rewarded with over 1300 responses from five continents.

The "typical" beekeeper in our survey is a 52-year-old North American male with a graduate degree. He has been keeping bees as a hobby for nearly nine years and maintains four hives. He used no treatments to fight mites last year but is comfortable using essential oils, powdered sugar, or drone trapping to control *Varroa* mites. He is also comfortable with not treating for mites at all. Politically, he is a moderate; religiously, he believes in God and practices a religion semi-regularly. He conserves energy and recycles. He likes animals in general. He has a stable personality, is a conscientious introvert, and tends to be agreeable and open to new ideas. The "typical" however often describes no one particular person. Variations are as many as there are beekeepers, but there are some consistencies. Here are some of the specifics.

The Beekeepers

The beekeepers were asked to categorize themselves as Hobbyists, Sideliners, or Commercial beekeepers. (There is an interest in some parts of the U.S. to move away from the terms Hobbyist and Sideliner and replace it with "small-scale or backyard beekeeper," but for our purposes, the distinction between a self-defined hobbyist and sideliner seemed important.) When asked to classify themselves, about 5% labeled themselves as Commercial beekeepers, 12.7% as Sideliners, and about 82% as Hobbyists. And while most of the respondents lived and kept bees in North America, 84 were in Europe, 14 were in Oceania, four were in South America, three were in Asia, and two kept bees on two different continents.

Males out number females about 2:1

The beekeepers responding to this survey reported maintaining up to 16,000 hives. Yet because so many of the respondents are hobbyist beekeepers the median number of hives maintained is four. The 68 commercial beekeepers in this sample maintain the most hives. Their median was 550, with 200 as the most frequently reported number of hives kept by commercial beekeepers. The 165 responding sideliners report maintaining as many as 700 hives, but 25 is their median and 10 is the most frequently reported number. As expected the hobbyists maintain the fewest hives. The 1068 hobbyists report maintaining as many as 152 hives, but the median for this group is three hives and the most frequently reported number of hives is two.

The number of years keeping bees also varies with type of beekeeper. The commercial beekeepers have kept bees for the longest amount of time, with a mean of 23.4 years. The sideliners are next with 13 years and the hobbyists have kept bees for an average of 7.3 years.

Male beekeepers outnumber female beekeepers about 2.1 to one, 66% are male and 34% are female. The ratio of female to male beekeepers differs significantly across the three categories of beekeepers. Among hobbyists the ratio of male to female beekeepers is 1.8 to one (590 males, 332 females), for sideliners the ratio is 4.9 to one (122 males, 25 females), and for commercial beekeepers the ratio is nine to one (54 males, six females).

Beekeeping has no age limits, with reported ages ranging from five to 90. Male beekeepers, averaging 52.4 years, are a tad (but a statistically significant tad) older than female beekeepers, who average 49.8 years. The average beekeeper began keeping bees at age 42.

Beekeepers are also well educated. Of the 1130 who indicated their level of education 1.2% had some high school or less (some are not old enough to graduate high school), 5.8% had a high school degree, 28.7% had some college or a two-year college degree, and 19.7% had a 4-year college degree. Another 12.6% reported some post-college education with 32% having earned a graduate degree. This pattern is fairly consistent across the three types of beekeepers. It is interesting to note that beekeepers are over three times more likely than the general population to have earned a graduate degree.

Percent of Responses by Type of Beekeeper & Treatments Used Last Year to Treat For Varroa Mites

Treatment	Type of Beekeeper		
	Commercial	Sideliner	Hobbyist
Hard Chemicals	31.11	13.96	9.36
Soft Chemicals	28.30	22.07	14.91
Other Essential Oils	12.26	7.66	7.94
Powdered Sugar	10.38	17.57	25.62
Drone Trapping	8.49	9.10	9.96
No Treatments	9.43	28.28	32.21

Note. Some beekeepers used more than one type of treatment.

A short personality questionnaire was imbedded in the survey. The personality traits measured were: Openness (open to new ideas and ways of doing things), Emotional Stability, Extroversion, Agreeableness, and Conscientiousness. These are known as the Big Five personality factors, and their measurement with this short tool is both valid and reliable.

Of the five scores, beekeepers differed from the general population on all but one – conscientiousness. Both beekeepers and the general population tend to score high on this scale. Of the remaining four scales, our beekeeper sample tended to be more open to new ideas, more emotionally stable, less extroverted, and more agreeable than the general population.

Beekeeping

While this survey focused primarily on the beekeeper rather than beekeeping practices, several questions did address beekeeping treatments and beekeeping success. In the last 20 years the treatment for *Varroa* mites has been at the forefront of the beekeeper's mind. We asked the beekeepers what treatment they used in the past year. Their options were hard chemicals (such as coumophos, fluvalinate, and/or formic acid), soft chemicals (such as thymol), other essential oils, powdered sugar, drone trapping, or no treatments. Not surprisingly, the different types of beekeepers differed significantly in the type of treatments they used. The most frequently cited method of treatment by commercial beekeepers was hard chemicals, but for both sideliners and hobbyists the most frequently cited treatment was "no treatment at all." The table indicates the percentage of each type of beekeeper using each type of treatment.

The beekeepers were also asked to rate their comfort level with these treatments on a seven-point scale from one (very uncomfortable) to seven (very comfortable). Differences between commercial and hobbyist beekeepers are evident in these comfort levels. In fact, comfort with essential oils is the only treatment that does not differ among beekeeper types. Sideliners fall between the commercial and hobbyist beekeepers on comfort using all the treatments and do not differ statistically from either type of beekeeper on any of these treatments.

Overall, commercial beekeepers are more comfortable with both hard and soft chemicals than hobbyist beekeepers. Conversely, hobbyists are more comfortable with powdered sugar, drone trapping and no treatment than commercial beekeepers. The means for all comfort levels for all three types of beekeepers are presented in the table.

Perceived Success as a Beekeeper

The survey respondents were asked for their definitions of success and these definitions were diverse. Most definitions (57.6%) focus on both products and bee survival while 21.2% focus only on bee survival. Personal satisfaction appeared in 10.4% of the responses, with 8.5% focused entirely on products.

As we look further at the responses on success, it is important to realize that ratings are based on a personal definition of success. It reflects a sense of satisfaction in the beekeeping experience.

The beekeepers rated their success over the past 12 months and over their careers on a seven-point scale where one meant very unsuccessful and seven meant very successful. Despite the dire news in the press about the state of the beekeeping industry, the respondents to this survey feel relatively successful. Considering four as a neutral rating (neither successful nor unsuccessful, the respondents averaged a 4.8 rating of their success for the past year and a 5.1 rating for their careers. Examining the success ratings for the last year as compared to the ratings for the career, respondents rate the last year significantly lower than their careers. Perhaps past years' success is viewed through rose-colored glasses, or beekeeping success is more illusive today than in the past.

Beekeeper types differed on their ratings of success across their careers. Commercial and sideliner beekeepers rated career success significantly higher than the hobbyist. All three groups most frequently rated their career success a six, yet more hobbyists rated their success a one through four than would be expected in comparison with the sideliners and commercial beekeepers.

Success does not appear to be enhanced by the use of hard chemicals. When the beekeepers using hard chemicals are compared to those reporting no treatment, the no treatment group reports a greater sense of success. One might wonder if this is related to differing beekeeping practices or to differing definitions of success.

Broader Attitudes and Behaviors

There were 46 statements about religious, political, and environmental attitudes and behaviors to which the beekeepers were asked to rate their agreement on a scale of one to seven (one meant strongly disagree while seven was strongly agree). Many of these statements were asked both positively and negatively to increase statistical reliability.

The deep history of beekeeping is replete with ties to religion such as Biblical references and ancient Egyptian tomb art. Many of the men important in modern beekeeping were men of faith exemplified by L.L. Langstroth who was a reverend as well as A.I. Root, and C.C. Miller who were both spiritual by nature. It is interesting to note that in our survey modern beekeepers tend to the spiritual side, yet they are less likely to practice their religion regularly than might be predicted by their ratings of belief and spirituality. The three types of beekeepers did not differ on the religion-related items.

Unlike the religion-related items, commercial, sideliner, and hobbyist beekeepers do differ on the politically related items. The commercial and sideliner beekeepers tend to be politically conservative-leaning moderates, while the hobbyists are more liberal-leaning moderates.

Other items on the survey in this section were related to the environment, including recycling. There are some differences among the types of beekeepers but the overall pattern is that the hobbyists are somewhat more likely to recycle and think it worthwhile than the commercial beekeepers, with the sideliners generally falling in-between. Overall, however, beekeepers are recyclers of plastic, glass, paper, and metal; they think it is worthwhile and their mean rating of agreement is greater than the neutral four rating on all of the positively worded recycling items.

Relatedly, beekeepers generally agree with the statement that "I consciously try to protect the environment" (M = 6.0) and "I conserve energy" (M = 6.2), although, again, commercial beekeepers agree less strongly with these statements than do sideliners or hobbyists. The mean agreement with "I conserve energy because it is economical" is 5.8 and with "I conserve energy to reduce greenhouse gasses" is 4.6 (commercial beekeepers agree less strongly than hobbyist beekeepers on the latter statement). The beekeepers tend to agree that global climate change is occurring (M =5.1), and that "Global climate change is the result of human behavior" (M= 4.7). While the commercial beekeepers' mean agreement scores are above the neutral four on both of these items, they agree significantly less than sideliners and hobbyists that climate change is occurring and that it is the result of human behavior. In general, the beekeepers disagree with the notion that nature can rebound from anything (M=2.9) and the earth's resources are meant to be used (M=2.2) and agree that Earth is a gift (M = 6.1) and that people should manage Earth's resources wisely (M = 6.6).

Mean of Comfort Using Various Treatments by Type of Beekeeper

Treatment	Type of Beekeeper		
	Commercial	Sideliner	Hobbyist
Hard Chemicals	3.18	1.93	1.82
Soft Chemicals	4.09	3.29	3.08
Other Essential Oils	3.50	3.71	3.90
Powdered Sugar	3.11	4.53	5.00
Drone Trapping	3.52	4.17	4.37
No Treatments	2.66	4.39	4.64

Note. 1 = very uncomfortable, 7 = very comfortable

Conclusions

Beekeepers are a diverse group. They are comprised of both males and females from the very young to the very old. They may not have completed high school (yet) or they may have completed a post-graduate degree. While some keep bees as their primary or a side business, the vast majority keep bees as a hobby. How they treat their bees and their comfort level with different treatments varies with their self-defined role as a Commercial, Sideliner, or Hobbyist beekeeper. Beekeepers report stable, agreeable, open, conscientious, and somewhat introverted personalities but they still maintain diverse attitudes about religion and politics. As a group, however, beekeepers agree on the value of recycling and energy conservation, and that the Earth is deserving of protection and careful management of its resources.

This survey addressed only a tiny percentage of the questions that could be asked of beekeepers. It probably did not ask the questions in which many of you are most interested. This survey, however, is a start, and gives a glimpse at the qualities and characteristics of those people who follow C.C. Miller in spending "their years among the bees." BC

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September? Already?

Plan *NOW* For Future Meetings.

Ann **Harman**

Yes, the Summer is over and now beekeeper association meetings need to be planned. The picnics and open-hive workshops were great. Those types of meetings seem to take care of themselves. But now it's time to plan meetings for the months ahead. If there's no plan we'll all have to listen to Beekeeper Burt ramble on about the "good old days" before *Varroa*. We've heard it all before, too many times.

The October meeting can be both fun and informative. The honey has been harvested and is ready for sale. The subject of the October meeting is HONEY. Everyone, whether a fairly new beekeeper or experienced, needs to bring a jar of his or her honey. The newbees, who just started beekeeping this year, may not have honey yet. So perhaps several of the other beekeepers can bring an extra jar. The beekeeper who mentored a newbee could contribute a jar. It will be much easier for the program if the honey is in a one-pound queenline-type jar with no label. It would be nice to bring a label to put on the jar later in the program. You will see why jar and label are part of the program.

Someone in the club is sure to have a refractometer and polariscope. These come to the meeting. Someone can bring other supplies usual for judging and tasting honey: toothpicks or plastic coffee stirrers, water (for cleaning refractometer and for drinking), some paper cups for water, something to clean up sticky tables, and anything else you can think of.

Here is what this meeting is all about. Everyone will be able to have their honey tested for moisture content and viewed in the polariscope for crystals, foam, lint, dirt. In other words everyone will have an informal judging of the recent honey crop. (It's easier to see through a one-pound queenline jar in the polariiscope.) In addition, everyone will be able to taste all the honeys. If someone managed to harvest some perfectly horrible tasting honey, a jar of it can demonstrate that not all honeys are delicious. (Keep the cups of water handy.)

The meeting can begin with information about water content, fermentation, crystallization and how to produce a clean product. Even though members of the association live in the same general area it is surprising that different colors and flavors of honey are made. The beekeepers can see that awareness of nectar plants in their own area is important. Marketing can be discussed with emphasis on clean honey, jars that are not sticky and have proper fill, and an evaluation of labels.

The program can end with putting the labels on the jars and having a grand honey exchange.

November usually means the start of the holiday season. The theme for this meeting is COOKING FOR THE HOLIDAYS. This meeting can actually be done in different ways. The venue for your meetings may influence what can be done. Some places may not want any food present or perhaps no food demonstrations. Here's a way to cope with "no food." Ask everyone to bring a container with about a half-dozen cookies or pieces of cake, or a few slices of a quick bread, or some candy, all made with honey of course, and enclose the recipe. The program will basically be a lecture about ways to cook with honey, types of honey to use in different kinds of recipes, suggestions from the audience, and finish the meeting with a grand exchange of the goodies brought.

Let's hope you can bring food and can make something. One or several of the "honey chefs" in the club can offer to do a cooking demonstration. Several others can bring something made with honey that would be suitable for a holiday meal.

If the club can supply some little paper cups and little spoons everyone can have all sorts of taste samples. A cranberry sauce made with honey, a honey glaze for ham, a party punch or even eggnog, Christmas cookies, a quick bread, candy and other items.

In this way you can have a pre-holiday party meeting, gain some new recipes for your family holiday gatherings and learn more about honey cookery. You might want to think about inviting a reporter from your local newspaper to attend the meeting. Any publicity about using honey in the home is valuable.

The December meeting is going to feature WAX. Surely someone in the club, or a neighboring club, makes candles. The holiday season is the time for candles of all kinds. Perhaps the candle maker (or perhaps several makers) could give a presentation on cleaning cappings wax, perhaps bleaching and dyeing, and molding. A display of various Christmas-theme molds would be appropriate with some samples. Beeswax can be painted, also. Although many beekeepers prefer the natural color, customers frequently want something fancier. Perhaps a demonstration of painting and decorating candles would be welcome.

Candle molds are available on the Internet but about every bee supply suwiness shows a large assortment of Christmas-theme molds. Yes, the flexible molds are expensive but Autumn craft fairs are a good place to sell candles. Check out a few companies and see if you can't get a supply of catalogs to distribute.

At one time small beeswax ornaments were popular and molds were available. Today these seem to have disappeared. Candy molds are available however with Christmas themes. Unfortunately the wax cannot be at too high a temperature. If a candle maker has some of the ornament molds perhaps the club members could each pour an ornament to take

home. The amount of wax is small so the ornament cools quickly.

Christmas-theme candles make excellent Christmas gifts. Although the Christmas rush leaves no time to make many candles now, the project can be done throughout the year. At least the club members now know how to make candles.

Another suggestion would be to have some of the colorful foundation wax available so everyone could make a pair of rolled candles to take home. Perhaps a small donation to cover costs of wick and foundation would be appropriate. Those who know how to make rolled candles could help those who have never made any. It's a good club project for a December meeting.

Hang up your new calendars. It's January. Guess what will be here before you know it. The Spring beekeeping classes for beginning beekeepers. This January meeting is PLANNING TIME. Don't get up and leave. Your input is valuable. Here are the newbees, the ones who took your course last year. Now that they have kept bees for several months after taking the classes it is time for each of them to comment.

Let each one give their views. What parts did they find really valuable. What parts did not seem to help them very much. Did they receive a beginning beekeeper book? Did they like it? Encourage them to give their views and show appreciation for them. Previously at the end of your bee classes I am sure they all said it was wonderful. But perhaps, after those months with real bees in a real hive, they feel some of your course was still great, but maybe some parts were not so important. Perhaps something needs to be added or eliminated or changed.

It is still early enough in your class planning to change emphasis if necessary. True, not all the newbees will be in agreement. But all their comments are important and give the planners something to think about. Listen to the experienced beekeepers also. They may not agree among themselves or with the comments of the newbees. That's fine. Everyone should listen and think, even after the meeting is over.

For this meeting you might want a Moderator. It can be the President or someone else. The purpose is to give everyone a chance to say something. However, someone who is known to be able to talk forever may need to be gently asked to allow others to speak.

If some of the newbees could not attend this meeting it would be both polite and worthwhile to contact them soon after the meeting to listen to their comments and, in exchange, give them a summary of the comments made at the meeting.

Now that the bee class planners have had a review of last year's classes it is time for the February meeting. This month it is ENLIST ALL AS HELPERS. Sit down. It's not time to go home yet. You are sure to have one newbee who says "I don't know anything so I don't see how I can help." Well, that newbee is just the one who can put some posters in several places to advertise the bee classes. Are you going to order books? Someone else can do that. Will you be giving some handouts? Give a draft of them to one or more beekeepers for proofreading.

Distribute the tasks. Someone can contact equipment suppliers to send catalogs. Did you plan on a display of basic equipment? See if several beekeepers can help with that. Have a "fashion show" of different kinds of veils and bee clothes so that the attendees can see which they like. Look at your schedule – does it include breaks with something to drink and nibble? One or more of your members can do that, including newbees. Asking those newbees to help is a good way for them to become involved with the association. Yes, some newbees will drop beekeeping and your club, too, but most will keep going. Your association needs enthusiastic members to survive.

This meeting is a good time to ask for mentors for the new class. Encourage new participation in your mentor program. You could even ask an enthusiastic 2010 newbee to be an apprentice mentor for a 2011 newbee. It's an excellent opportunity for last year's newbees to expand their skills and knowledge.

By the end of the meeting everyone should have a task, even if it is just one small task. Just think – when your bee classes are over you have a whole new list of volunteers for next year.

Planning meeting topics in advance makes sense. The time it takes in the planning stage actually saves time in the long run. BC

Ann Harman plans meetings, judges honey and writes for Bee Culture *from her home in Flint Hill, Virginia.*

BEE PLANT REFERENCES AND SOURCES OF INFORMATION

Connie **Krochmal**

Many kinds of sources provide information on bee plants and bee gardening. In addition to books and pamphlets, there are also online resources. The following sources are especially helpful to beekeepers.

Some Recommended Websites

Many state and local beekeeping organizations have websites featuring photos of bee plants currently in bloom. In addition, the following websites provide information.

About.com (**http://gardening.about.com/od/atttracting wildlife/a/Bee_Plants.htm**). This has several pages on bee gardening and a list of bee plants.

Bee Friendly Nursery, Suffolk, England (**www.beefriendlyplants.co.uk**). They will have online bee plant catalog soon.

Bee Lab, The Ohio State University (**http://beelab.osu.edu/**) Dr. James E. Tew provides links to the lab's bee garden plant list and native plants for bees.

Devon Beekeepers Association (**www.devonbeekeepers.org.uk/**). This site has various links. These include garden plans for the bee garden at the 2009 Chelsea Flower Show and several leaflets, including Trees Useful to Bees.

English Cottage Garden Nursery (**www.englishplants.co.uk/bees.html**) has a list of wildflowers for bees.

Melissa Garden (**www.melissagarden.com**). The Plants for Honeybees link has an extensive list. This also lists the top five bee plants, and ornamental plants for honeybees. Located in Healdsburg, California, the Melissa Garden, named for lemon balm, has been designated a honeybee sanctuary.

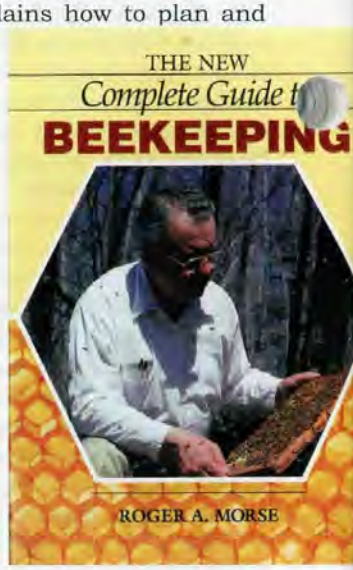
Portland Bee Center at Livingscape (**www.livingscape.com/beeplants.htm**). This Oregon site has a list of perennials for bees.

Wikipedia has an extensive list of crop plants pollinated by bees: **http://en.wikipedia,org/wiki/List_of_crop_plants_pollinated_by_bees**.

Bee Plant Publications

American Honey Plants. Frank C. Pellett. Originally published in 1920, the fourth edition was released in 1976 by Dadant. The bee plants are arranged by common name. This excellent title gives details on each plant's distribution, cultivation, and value to bees. The author quotes extensively from beekeepers, the American Beekeepers Journal, and state sources, such as Richter.

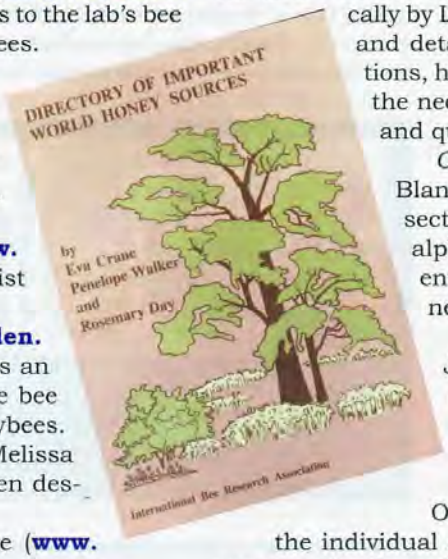
The Bee Friendly Garden. Ted Hooper et al. Alphabet and Image Ltd. 2006. This explains how to plan and care for the bee garden. Much of the book is devoted to the bee plants. The plant entries provide details on the nectar and pollen, growing conditions, and plant descriptions. Measurements are in metric and inches/feet.



The Complete Guide To Beekeeping. Dr. Roger A. Morse. Pelham Books. 1978. London. This contains chapters on the major and minor honey plants. There is also one on honeydew plants.

Garden Plants Valuable To Bees. Mary F. Mountain et al. International Bee Research Association. London. 1981. This handy reference has a table for each plant group, such as perennials. The plants are organized by Latin name. This provides the common name, bloom time, and the flowers' value to bees. Measurements are in inches/feet and metric.

Directory Of Important World Honey Sources. Dr. Eva Crane et al. International Bee Research Association (IBRA). 1984. This is available as a book and CD from IBRA (**www.ibra.org.uk**). Measurements and weights use the metric system. This has separate sections for nectar and honeydew plants. Plants are listed alphabetically by Latin name. Some profiles are lengthy and detailed. This gives the growing conditions, hardiness, common names, details on the nectar flow, pollen, honey descriptions and qualities, and expected honey yield.



Guide To Bees And Honey. Ted Hooper. Blandford Press. 1979. This has a brief section on honey plants. These are listed alphabetically by common name. The entries give the bloom time, details on nectar flow, honey, and pollen.

Honey Plants Of North America. John H. Lovell. This classic reference was originally published in 1926 by A.I.Root. Reprints are available from Bee Culture (**www.BeeCulture.com**), 800-289-7668 x3220).

One section deals with beekeeping in the individual states. Pollen plants and honeydew sources also have their own sections. The introductory section has in-depth information on the various flower types and nectar flow.

Much of the book is devoted to individual bee plants listed alphabetically by common name. The plant profiles have details on the flowers and their value to bees, bloom time, description, distribution and habitat, honey description and qualities, the reported honey yield, and the pollination needs of the plants.

100 Easy-To-Grow Native Plants For American Gardens In Temperate Zones. By Lorraine Johnson, this was published in 1999 by Firefly Books. It has color photos by Andrew Leyerle. Plants are arranged alphabetically by

common name. The plant entries feature a description, growing conditions and care, propagation, hardiness, habitat, companion plants, and related species. This indicates which species are useful to bees.

Plants And Beekeeping. F.N. Howes. Faber and Faber. London. 2007. This explains how to plan the bee garden. It covers a range of bee plant topics, such as poisonous and noxious honeys, and pollen sources. One section presents the major honey plants of England. This also covers minor nectar/pollen species. The plants are alphabetical mostly by common name.

Trees And Shrubs Valuable To Bees. M.F. Mountain. Bee Research Association. 1975. Bucks, England. This quick reference guide has separate sections for trees and shrubs. Within each section the plants are arranged by Latin name. Each entry explains the flower's value to bees, flowering time, plant size, and details on the flowers.

Wildlife At Your Backdoor-How To Create A Haven For Nature's Friends. By Sharon Amos, this was released by Reader's Digest Books. No publication date is listed. The plants recommended for bees display a symbol. An especially good gardening book for beekeepers, it explains bee-friendly garden design, plant selection, organic pest controls, and garden maintenance. This has a section for each plant group, such as trees.

Other Wildflower Books

A number of wildflower books contain information on bee plants. These include the following.

A Guide To Enjoying Wildflowers-Stoke's Nature Guide. By Donald and Lillian Stokes, this classic reference was released in 1984 by Little Brown. It features 50 of the authors' favorite wildflowers. This user friendly guide lists the plants alphabetically by common name. The lengthy plant profiles cover each species through the seasons, related species, its nectar/pollen status, easy to follow descriptions, and ID tips.

Forest Plants Of The Southeast And Their Wildlife Uses. This revised edition by James H. Miller et al. was published by the University of Georgia Press in 2005. This has multiple color photos of each plant. It gives an in-depth description and profile for each species. It also mentions related species, and explains which flowers are visited by bees.

Green Dragons And Doll's Eyes-A Wildflower Garden Guide. By Donna Levy, this was released by Cornell University in 1986. As a guide to the Mundy Wildflower Garden at Cornell Plantations, this features drawings of the plants and a handy chart. For each species, this gives a description, natural history, and the flower's value to insects.

Native Trees, Shrubs, And Vines-A Guide To Using, Growing, and Propagating North American Woody Plants. By William Cullina, this was published by Houghton Mifflin in 2002. This has lush color photos of each plant. The plants are organized by Latin name. There is a full introduction to each genus and in-depth details on each species. For each plant, this has a description, its growing needs, and hardiness. The plants' value to bees is discussed.

The New Gardening For Wildlife-A Guide For Nature Lovers. By Bill Merilees, this was released by Whitecap Books in 2000. This has a chapter on insect-friendly gardens. A handy chart indicates which plants attract bees and other insects.

The Secrets Of Wildflowers-A Delightful Feast Of Little-Known Facts, Folklore, And History. By Jack Sanders, this was published by Lyons Press/Globe Pequot in 2003. This has a section for each season. Within each section the flowers are organized by bloom time. The lengthy plant profiles feature a description, ID tips, plant history, origins, and uses.

Southeastern Wildflowers. By Jan. W. Midgley, this was released in 1999 by Crane Hill Publishers. With color photos of the plants, this provides a comprehensive profile for each species with a description, gardening tips, propagation methods, and related species. This covers the plant uses, including nectar/pollen sources.

A Sampling of Regional and State Guides to Bee Plants

State guides are very helpful not only to state residents but also to those in adjacent states that share similar growing conditions. The following is a sample of the state guides that are available.

A Florida Beekeeping Almanac. Dr. Malcolm T. Sanford. Circular 537. University of Florida, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences (IFAS). Copies are available from the extension service (University of Florida, Publications Distribution Center, IFAS Building 664, Gainesville, Fl. 32611). This lists the regions and bloom times for the major honey plants.

Beekeeping: Florida Bee Botany. (**http://edis.ifas.ufl.edu//aa088**) This user-friendly source by Dr. Sanford lists the plants by common name with separate lists for major and minor nectar/pollen plants. This also covers cultivated ornamentals and undesirable native species.

Beekeeping In South Carolina. Bulletin 122. South Carolina Cooperative Extension Service, Clemson University. Reprinted Oct. 1987. This can be ordered from Clemson University. It has a chart for each region with the approximate bloom time for the major honey plants in the state.

Flowering Plant Species And Their Relative Attraction To Honey Bees And Native Bees. A link for this online table is at **http://nature.berkeley.edu/urganbeegardens/**. This has codes and abbreviations at the end. The plants are organized by family and alphabetically within the family by Latin name. This notes the frequency of bee visits to each species. *Honey Plants Of California.* M.C. Richter. Bulletin 217. June 1911. University of California, College of Agriculture, Agricultural Experiment Station, Berkeley. This is available at **www.oac.cdlib.org/data/13030/w5/kt1s2023w5/files/kt1s2023w5.pdf**. This lists the plants by family. For each plant, this indicates its distribution in the state, the bloom time, bee value, and honey description.

Texas Honey Plants. C.E. Sanborn et al. Texas Ag-

ricultural Experiment Station Bulletin 102. Jan. 1908. Dept. of Entomology, College Station, Texas. (**http://hdl.handle.net/1969.1/3440**). Plants are listed by family. It indicates where the plants are found, the bloom time, and bee value.

Garden Catalogs

The following free catalogs have a bee symbol beside the name of each plant that attracts bees.

High Country Gardens. (**www.highcountrygardens.com**), 800 925-9387) specializes in drought resistant natives.

Jelitto (**www.jelitto.com**) is a German wholesale seed company. They issue an English catalog for American wholesale growers. Their specialty is perennial seeds.

The Stokes Seeds catalog (**www.stokeseeds.com**), 800-396-9238, Box 548, Buffalo, NY. 14240-0548). This has separate sections for annuals, pot plants, and perennials/biennials.

Upcoming Bee-Friendly Plant Program At Retail Nurseries

A new marketing program will make it easier for beekeepers to shop for bee plants. Beginning in 2011 participating nurseries and garden centers can clearly identify bee plants by using the new Bee-Friendly Plants program. This will include distinctive pots, plant labels, and signs featuring the Bee-Friendly logo depicting a bee.

Out-of-Print Publications

Though the following are out of print, these are available from used bookstores and elsewhere.

Beekeeping In The United States. USDA Agricultural Handbook #335. By E.C. Martin et al., this was released in October, 1980. Published by the Science and Education Administration, it has a helpful table listing the major honey/pollen plants by common names, and indicates the region/regions (including Alaska and Hawaii) for each species.

A Calendar Of Bee Plants. Dorothy Hodges. International Bee Research Association. Reprint M94, originally from Bee World 59(3): 97-100(1978). This chart shows the bloom time from February through September for 105 bee plants yielding nectar and pollen. Data was compiled in Surrey, England from 1940-1957.

Brushy Mountain published several lists of bee plants that I compiled for them in the early 1990s. These included Planting For Bees in the Southeastern United States. This devotes a section to each plant category. Within each category, the plants are alphabetical by common name. The other title is A Planting Calendar For Bees. This lists the bee plants in bloom from January through September. Within each month these are arranged alphabetically by common name.

And for a more general listing of pollinator friendly plants, check out www.pollinator.com for their recommended regional planting lists. BC

Connie Krochmal is an award winning garden writer and a beekeeper in Black Mountain, South Carolina.

GLEANINGS

SEPTEMBER 2010 • ALL THE NEWS THAT FITS

HONEY BEES CHECK-IN ON BROWN PALACE HOTEL

The Brown Palace Hotel and Spa in Denver, is the first hotel in the city to nurture a colony of rooftop bees that will produce honey to be served during afternoon tea.

While past Brown Palace guests have included royalty, the hotel now has its own resident queen . . . two of them actually, and 20,000 worker bees that are expected to grow to 140,000 by the end of the Summer.

Two hives will be maintained by dedicated Palace beekeeper, Matt Kentner of Kentner Farms, who sources beehives to local farmers and ranchers to assist in the essential pollination of their crops.

"Unfortunately there are a lot of misconceptions about the nature of bees and what crucial roles they play in our food supply and environment. The affects of the decline in bees is extremely alarming and it's important that we build awareness and do our part to help," says Kentner.

To further contribute to local bee vitality, The Brown Palace has donated two beehives to the Denver Beekeepers Association to assist in establishing hives in the Denver community and has also partnered with Denver Parks & Recreation to plant bee-friendly flowers in the nearby Civic Center Park.

"We've worked for years to bring urban beekeeping to fruition in Denver and The Brown Palace has demonstrated a true commitment to fostering these efforts in our community," states Marygael Meister, president of the Denver Beekeepers Association.

In addition to use during the hotel's afternoon tea, the hotel hopes to eventually utilize the honey in other signature recipes and spa treatments.

The Brown Palace has created a web page dedicated to providing information about bees, the severity of colony collapse disease, and what people can do to help at www.BrownPalace.com.

Name the Hives Contest

The public can give suggestions on what to name each of the two hives on the hotel's facebook and twitter pages. The contributors of the top two names chosen will win a weekend getaway at The Brown Palace.

Continued on Page 75

SECTION 24(c) GRANTED FOR QUICK STRIPS

The State of Montana granted a Section 24(c) Special Local Needs registration for Mite Away Quick Strips (MAQS) on July 22, 2010.

Beekeepers in Montana can contact bee supply companies for pricing and availability.

Montana is the second State to arrange for a Section 24(c) registration, after Hawaii. California and Oregon have Section 24(c) applications under review. Other States have expressed interest.

Section 18 Emergency Use Registrations are not eligible until the Hivastan registration expires in October. NOD Apiary Products, the developer and manufacturer of MAQS, has applied to the EPA for a full Section Three registration, expected to take up to a year to complete the review process.

For more information, and a 2-minute video on applying MAQS, see the NOD Apiary Products website at **www.miteaway.com**, or contact Liz Corbett at 866-483-2929.

HONEY FROM INDIA BANNED

The European Union bans imports of Indian honey over lead contamination at and least one producer sees a China link.

The EU is the second largest destination for Indian honey exports after the United States.

"They are saying they will not accept any shipments from here, there are problems of lead contamination and residue in the honey," Indian Commerce Secretary Rahul Khullar tells reporters in New Delhi. "I am looking at how we will fix that."

The EU is the second largest destination for Indian honey exports after the United States.

The Economic Times of India quotes one official as saying some producers use antibiotics or chemicals to restrict bacterial growth in their hives this residue could have collected in the honey.

But honey exporter Kejriwal Bee Care India Pvt. Ltd. director Prakash Kejriwal is quoted as saying the main problem is that a large number of exporters import cheap honey from countries such as China and, after value addition, they export to the EU.

"The government should first restrict the Chinese imports," Kejriwal says. "I think this will solve the problem to a large extent."

Indian honey producers and the Export Inspection Council (EIC) are discussing the ban with Indian Commerce Ministry officials.

India exports honey to more than 60 countries and shipments were worth $32.39 million in 2008-09. About $7.7-million worth was sold to the EU. – *Alan Harman*

CHEAP IMPORTS – SOUND FAMILIAR?

Some New Zealand retailers are threatening the credibility of the country's honey and beekeeping industries with false claims about the products they are selling.

Happy Valley Honey (New Zealand) Ltd. says the Commerce Commission has ruled against several New Zealand retailers for "passing off" internationally sourced royal jelly in capsule form, with lower standards and active ingredients, for fresh royal jelly produced in New Zealand.

New Zealand royal jelly is considered a higher quality than royal jelly from other parts of the world because it generally has higher levels of the active ingredient 10HDA.

Happy Valley general manager Mark Harvey estimates lost revenues for his company of NZ$120,000 a year as a result of the cheaper products being in the market.

This has led the South Auckland based producer to seek overseas markets for this premium product.

"As New Zealand's largest producer of fresh royal jelly, we have been frustrated for some years by the sale of royal jelly encapsulated products that have misled the public in terms of the product being fresh and sourced from New Zealand," Harvey says. He recently returned from Asia and the Middle East, where a Happy Valley Honey retail store has opened in Hong Kong.

"We have found the interest for New Zealand royal jelly to be extremely high overseas," he says. "Our largest customer is a group of pharmacies and medical centers based in the Middle East."

Harvey says he is concerned about the New Zealand public's perception of fresh royal jelly products.

"From an industry view it is a shame the New Zealand public have been seduced into buying royal jelly tablets believing it is New Zealand sourced via misleading advertising and label presentation," he says.

"Our success is built on the trust of our customers as they know our products are 100% New Zealand natural.

Alan Harman

SMALL HIVE BEETLE & ASIAN BEES IN NORTHERN AUSTRALIA

Small hive beetles have been found in far north Queensland.

The Australian Broadcasting Corp. says there are concerns the spread of the beetle could destroy bee hives and hinder crop pollination.

The new infestation of the beetle has been found in the Cairns suburb of White Rock and has the potential to destroy hives. State Primary Industries Department senior apiary officer Peter Warhurst says the pest is wiping out feral bees.

"Some of the farmers who've relied on free pollination from the wild colonies of European bees won't get that pollination because these beetles have been getting rid of a lot of the hives," he says.

Warhurst says authorities are researching ways to eradicate the beetle and beekeepers can also help.

"If the beekeepers haven't got it, then they want to be vigilant and watch for it and they should be trying to buy some of the better type of traps to put in their hives to try to keep the numbers down," he says.

"If they can keep trapping them and keep the numbers down, then they're not going to be in strife."

Queensland Beekeeping Association president Trevor Weatherhead tells The Cairns Post newspaper if the pest is allowed to spread further, it could have a devastating effect on the region's crops.

It says the beetle has wiped out about a third of individual keepers' hives in New South Wales to the south and has caused an estimated A$10 million damage in southern Queensland.

Quarantine officials are already battling an incursion of Asian honeybees in the Cairns area.

Asian bees were first discovered in Cairns in May 2007 by a beekeeper called to remove a nest of nuisance bees from inside the mast of a yacht. Thus far, no Varroa mites have been found on any of the bees, but over 150 nests have been removed and the bees are still moving..

– Alan Harman

BEE PASTURES

James Cane examines wildflowers in a Logan, UT test plot. (photo by Peggy Greb

Floral havens planted with wildflowers are being proposed as a way to produce successive generations of healthy young bees.

U.S. Agricultural Research Service (ARS) entomologist James Cane says the pesticide-free bee pastures could be simple to establish, and – at perhaps only a half-acre each – easy to tend.

"Bee pasturing is an efficient, practical, environmentally friendly, and economically sound way for bee managers to produce successive generations of healthy young bees," he says.

Bee pasturing isn't a new idea, but studies by Cane and his collaborators over the last four years, conducted in a research greenhouse and at outdoor sites in UT and CA, are likely the most extensive to date.

The research indicates species of pastured pollinators could include the blue orchard bee, Osmia lignaria. This gentle bee helps with pollination tasks handled primarily by the premier pollinator, the European honey bee *Apis mellifera.*

Cane estimates that, under good conditions, blue orchard bee populations could increase by four- to fivefold a year in a well-designed, well-managed bee pasture.

He says blue orchard bees would be taken out of a bee manager's Winter storage and brought to the pasture, where they would emerge from their cocoons, mate, and, if female, lay eggs, before dying.

The following year, some of the new generation of bees that developed from those eggs would be brought to commercial almond orchards to pollinate the trees. But most of that generation would be returned to their parents' pasture to produce yet another, hopefully larger, generation.

Ideally, this would continue year after year, with each year's new generation larger than the one it replaced.

Cane and team have also selected wildflowers that might be ideal for planting at bee pastures in CA. In particular, the team was interested in early-flowering annuals that could help bolster populations of blue orchard bees needed to pollinate California's vast almond orchards.

The research, funded by ARS and the Modesto-based Almond Board of CA, resulted in a first-ever list of five top-choice, bee-friendly wildflowers for bee pastures in almond-growing regions.

These native CA plants are: Chinese houses (*Collinsia heterophylla*), CA five-spot (*Nemophila maculata*), baby blue eyes (*N. menziesii*), lacy or tansy phacelia (*Phacelia tanacetifolia*), and CA bluebell (*P. campanularia*).

Though blue orchard bees gathered nectar and pollen from all of the species, a key requirement for wildflowers on the list, the bees' obvious favorite was the bright-pink blossoms of the Chinese houses plants.

Wildflower species had to have more attributes than merely appealing to bees, however. Cane's team made sure each of the select species flourishes in the same climate and soil as that of almond orchards, and that the wildflowers bloom at about the same time of year as those trees.

The wildflowers also met other criteria: They are rich in pollen and nectar and are reasonably easy to grow. And their seed is commercially available.

The researchers determined before deciding the wildflowers were pasture-perfect. For example, the scientists either newly determined or confirmed the amount of pollen and nectar produced by the plants, and they noted the timing and duration of the bloom.

They estimated how many flowers were produced per acre, and then calculated the "carrying capacity" of each species, that is, the number of blue orchard bees that these plants could nourish.

Cane estimates every 10 square yards of pasture planted with a mix of these five flowers could provide enough pollen and nectar to support 400 mother bees. In turn, these pastured parents could produce enough progeny the following year to pollinate three acres of almond trees.

Cane says the bee-pasturing approach could perhaps be developed for other regions where other tree crops that blue orchard bees pollinate are grown, such as the cherry, apple, or pear orchards of the Pacific Northwest.

– Alan Harman

PLANT A BEE GARDEN

Britain's Horticultural Trades Association's PlantforLife campaign has teamed up with the British Beekeepers Association to launch a downloadable guide to bee-friendly planting.

The guide provides a list of plants – together with tips on how and when to plant and care for them – that will encourage bees back into the garden.

"Many of the old fashioned flowers that our grandparents grew encouraged bees into the garden with their flowers literally filled with nectar," the HTA says. "However, many of our more modern garden plants, whilst having larger petals do not have as much if any nectar and so are not so friendly to bees, butterflies or other wildlife.

The plants featured in the guide include: buddleja, cornflowers, corn poppies, flowering currants, foxgloves, heathers, honeysuckle, lamb's ear, lavender, sea holly, sedum and sunflowers.

"The British Beekeepers Association was delighted to be able to assist the HTA in the preparation of their PlantforLife Bee Friendly campaign materials," association public affairs director Tim Lovett says.

"The HTA is keen to encourage gardeners to help bees, which are struggling against a number of problems and the advice the HTA has made available will make its own important contribution in the fight to help our bees."

The HTA lists a number of reasons for encouraging bees into family gardens: -

Bees add charm and character to our gardens, bringing them to life; creating a garden for wildlife can be a project the whole family can become involved in; encouraging bees also attracts hoverflies and other beneficial insects into the garden, helping to control pests and protect garden plants; bees can help make a garden more productive, especially if it has vegetables or fruit trees that need to be pollinated.

The HTA says all bees need a wide variety of pollen to keep them healthy and this where the group can come to the rescue.

"Collectively our great British gardens are the largest nature reserve in the UK," it says. "Our ponds have played a dramatic role in the survival of frogs, and now our flower borders could be vital to the survival of bees." – *Alan Harman*

ROOFTOP ... Cont. From Page 73

About The Brown Palace Hotel and Spa

The Brown Palace Hotel and Spa is a Forbes Four-Star, AAA Four-Diamond luxury landmark located in the heart of downtown Denver and was recently included in Travel+Leisure's Top 500 World's Best Hotels 2010. It is a charter member of National Trust Historic Hotels of America and is managed by Quorum Hotels & Resorts, a full service management company headquartered in Dallas. For more information or to make reservations please call 303.297.3111, 800.321.2599 or visit **www.brownpalace.com**.

About Kentner Farms

With an artisan philosophy and emphasis on sustainability, Kentner Farms was established in 2007 to produce pure, raw Colorado honey as well as provide pollination, honeybee removal and personal beekeeping services, using chemical free methods to raise honeybees. For more information, please visit www.kentnerfarms.com or call 303-349-7280.

Denver Beekeepers Association: **www.denverbee.org/bees**

Display Advertisers

I've been riding my bicycle to town lately, for three reasons: To save the planet, reduce our dependence on foreign oil, and get a little exercise.

Coming out of Patti's Main St. Coffee House the other day, I mused that I might take a little two-wheeler side trip on my way home.

At first I thought I'd ride to the city limits, but when I got there, I felt pretty good. Maybe I'd turn around at a fork in the road a couple of miles farther on. But at the fork, for some reason I made a right, instead of a U-turn. Then I decided I'd stop at a nearby campground for a drink of water, but when I got there, I just kept going.

We'd had a little rain, so when the road turned to dirt, it wasn't dusty at all. It was only a few miles to the end of the road.

And that was how – like Forrest Gump when he ran all the way to the Pacific Ocean – I finally arrived at Tom's ranch.

Tom told me a long time ago that he'd welcome bees on his spread, and I thought it might be worth a try. There's not a lot of alfalfa up here, but it might make a good staging apiary, where my little darlings could feast on springtime dandelions, before I move them to the high country. Maybe bees would flourish here all summer. You never know.

Tom and I go way back. I was his straw boss when we cleared the original ski trails at Snowmass. When he came back from Vietnam, he made his fortune in ski photography.

Down at the house, I was greeted by his beloved dog, a cross between a (giant) Akbash sheep guard dog, and an Australian shepherd. I like those Akbash.

Some places just enchant you. There are a number of buildings on the property – the main house, a greenhouse, a sauna/guest house, another guest house – all built by Tom and his stonemason, who lives in one of the cabins. The buildings are not large, nor are they ostentatious. The accent is natural wood and stone. Everything looks like Tom either made it himself, or he inherited it. There are photographs everywhere. You don't have to take your shoes off to go inside. And just the right amount of clutter makes me feel right at home.

Tom and I sat outside and drank cool water from a tin cup. We talked about the good old days, and of course, bees. He was all for having them.

I asked about forage, and he pointed out a few fruit trees. I tried to explain that it really takes more than that. But mostly I was looking for a migratory location with dandelions. He assured me the valley turned bright yellow in May.

Tom showed me a photograph of a bear that climbed an apple tree next to his house and got off on the roof. But I'm used to bears. All of my yards have them. I put up solar electric fences and cross my fingers.

I once built a fireplace for a doctor. One of the laborers on the job had an unemployed stonemason friend who hung around some. He had a "portfolio" of photographs that featured his work.

I didn't think too much about it at the time. He might be the reincarnation of Michelangelo, but I had the job. I can swing a trowel, and Doc was a personal friend. Plus he owed me. When he fell off the second floor and nearly severed his spinal cord, he went wacky. When I directed the carpenters to help me immobilize him, Doc got belligerent. He's used to being in charge, but I told him, "Today I'm the doctor." He said some bad words. We held him down until the ambulance arrived.

Later, a humbled Doc shed a tear when he thanked me for saving him from paralysis or even death. No problem, Doc. I've been a ski patroller most of my life. This was just basic first aid.

After I finished the fireplace, there was some remaining stone work that for some reason wasn't supposed to get done until the following Spring. But in May, when I asked when I could get started, I learned that that other stonemason had gotten the job.

Doc said it was "a business decision." Naturally there were hard feelings on my part, more towards Doc than my rival, although looking back it felt creepy the way he slinked around the job with his "portfolio."

That was 20 years ago. Now I sell Doc honey. We laugh and shoot the breeze like all this never happened.

I always wondered what happened to the other stonemason, and now I know. He lives at Tom's ranch. He laid Tom's beautiful stone floors, the stone walls, the "water feature" in the greenhouse. He's very talented.

Tom introduced us on this last visit, and we shook hands like it was the first time we'd ever met. I wondered if he even remembered. I wouldn't have recognized him, but his name brought it all back.

Now I heard distant thunder. The sky looked ominous over the Flat Tops. I said, "Tom, I'd better jump on my bike, before I stay too long."

Heading down the lane back to the county road, I chuckled about seeing the mason with the portfolio again. It just didn't matter anymore.

What mattered was the rekindling of an old friendship, and a new home for my bees.

A Bicycle Ride

Ed **Colby**