HONEY COLORS! OVERWINTER!

Nov 2011

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FEATURES . . .

Soybeans as far as you can see, in Missouri.
See the story on page 40.
photo by Kim Flottum

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DEPARTMENTS & COLUMNS

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Bees In Afghanistan

I am in Afghanistan and I am trying to help the beekeepers here to improve their colonies. What are some of the best plants for bees that will help them build the hives as far as nectar and pollen for honey and wax. They seem to have a very poor ability to build wax. I am in the Gardez Province if that helps for reference of what plants to recommend. I told them cheap seed to use is sunflowers, they can eat the seeds and grind the dried plant and hulls for animal feed. Any help would be appreciated. Thank you for your time and effort on this matter.

SFC M. Jay Larrew
Afghanistan
mjlarrew@gmail.com

Thank You Ann

I don't have an email for Ann Harman but perhaps I could ask someone to please pass this on to her? The July 2011 issue of *Bee Culture* contained an article "Pot-luck" which had several recipes. My husband noted the Honey Lemon Slaw in particular, asked me to make it and even thought to buy a lemon! It's great. I've served it a number of times and have shared the recipe. Thanks all.

Linda Sennott
Luther, OK

HONEY LEMON SLAW

½ cup mayonnaise
2 tablespoons honey
½ teaspoon grated lemon rind
2 tablespoons lemon juice
¼ teaspoon ground ginger
4 cups shredded cabbage
½ cup raisins

Stir together first five ingredients. Add cabbage and raisins. Mix. Chill. Makes about eight ½ cup servings.

(from Ann Harman's honey recipes)

Inmates Learn Beekeeping

Lake Butler – Inmates at Reception and Medical Center are learning about beekeeping thanks to a new inmate re-entry program in conjunction with the Florida Department of Agriculture. As part of the program, inmates are learning how to maintain a colony of honey bees and collect honey. After an inmate completes the program and is released from prison, he has an immediate job prospect with commercial beekeeper Dave Mendes.

The program began in July with 10 beehives donated by the Florida Department of Agriculture and Consumer Services (FDACS) and 20 inmates. Upon completion, inmates earn a training certificate and the possibility of a rewarding career.

"Inmates who have a skill and a job are less likely to return to prison, so programs like this advance public safety," said Florida Department of Corrections Secretary Ed Buss.

Beekeeper and business owner Dave Mendes has guaranteed each inmate who successfully completes the program a job interview upon release from prison.

"I am very pleased to be a part of this program," said Dave Mendes. "The need for new beekeepers has grown in recent years, and FDACS has done a tremendous job putting this together. The beekeeping industry needs more programs like this."

Developed in partnership with the Florida Department of Agriculture and Consumer Services, this is the first and only beekeeping program in the Florida Prison system.

"Florida's honey bee industry has a tremendous impact on the economy and contributes significantly to the production of food and the viability of our natural ecosystems," said Florida Agriculture Commissioner Adam Putnam. "Jobs in agriculture are diverse and can be very rewarding. We look forward to working with the Department of Corrections to pursue every opportunity that promotes the health of the honey bee industry and creates long-term job opportunities in the industry."

Currently one of every three inmates released from the Florida prison system returns to prison within three years. Through programs like this one, the Department of Corrections is focusing on teaching inmates viable job skills that will lead them to productive jobs and law-abiding lives upon release.

For additional information contact the Department of Corrections, Office of Public Affairs (850) 488-0420 or Florida Department of Agriculture and Consumer Services at 888-397-1517.

Denise Feiber
Gainesville, FL

Observation Hive

Thank you very much for printing the article about my observation hive. Unfortunately, my contact information was not included, and I love contact. If anyone would like to respond to me about any aspect of observation hives, I would welcome their remarks. **jeannieal abeannie@yahoo.com** or 608-244-5094.

Jeanne Hansen
Wisconsin

Monsanto Buys Remembee?

Surely you cannot believe Monsanto has done this out of the goodness of their heart, or in seeking the biological welfare of any agricultural endeavor. It's not even about money for Monsanto; it's about control. Any company who would actively seek to shut down any organic farmer whose open pollinated crops were contaminated by Monsanto's pollen is NOT seeking

the welfare of farmers. (And they're doing this all over the country). Please don't be so naive as to think Monsanto is going to be the honey bee's savior. Follow them and see how they will use this new acquisition to research how they can air spray or genetically modify crops to accept their chemicals and reduce the impact on bees. Bees? What about the humans who will later consume those same chemicals. This is not about saving the bees; it's about expanding Monsanto into new arenas. See CATCH THE BUZZ™, September 28.

Stephen Felts

October Swarm

Mr. Lien I read your story "Swarm in October"-(*Bee Culture*, Oct. 2011 page 37). Your story is moving and I was touched by your closing statement in memory of your experience, "Perhaps a beekeeper out there will start an extra colony . . ." I have been a beekeeper for years and I am currently building more Warre hives to expand my Warre Hive operation this Spring. If you would like I will dedicate one of the hives as per your request to start an extra colony. If you would like to be a part of the process and dedication, please email me. I can keep you posted and send pictures as I build the hive this Winter and install the bees this Spring. **Eschmidt158@aol.com**.

Ernie Schmidt

INNER COVER

We recently received a request for magazines for students in a beginner's class. We give out thousands of magazines every year for meetings, for classes and for give-aways of all kinds. Although we try and guess each month how many requests we'll get it's a crap shoot and sometimes we run out until next month, and sometimes we have extras, but we almost always have some in the warehouse . . . maybe a couple months old, maybe this month's issue, but some. And for the last three or four years the number we order every month keeps increasing because both subscriptions and demand just keeps increasing. This is a great place to be and we're not complaining.

But a recent request said that their *free* annual beginner's class, which was limited to 50 students, was coming up and could we supply that many magazines please. Free, mind you! Moreover, membership in their local association, which all of these students were encouraged to join, was free also. Not surprisingly, because of this no-cost policy they have significantly increased the number of beekeepers in their area and in their club. They simply want as many people as possible who want to keep bees to have a chance to do so, and a free class, mentors, and free meetings will keep them keeping bees. It's certainly a noble goal, and it's been working for them for eight years

What do you think of that? Free, I mean. I'm certainly of mixed minds on this because I know that money is tight, times are hard, and beekeeping isn't a costless enterprise. It takes money to get into and stay in bees. And, the more you know about bees, the more help you can get to get started and keep going, the more likely you are to be successful . . . that is, capable of keeping your bees alive.

Our local group has a dues structure. And our annual beginner's class isn't free. The tuition covers a year's dues, a first class beginner's book, and about $5.00 for the club. I think we're more typical than not from what I see advertised in the magazine and from those groups I get to visit.

There's probably other free groups but I don't know of any. I'd like to find out how your group works if you don't charge for dues, for classes, for meetings. Maybe you can share some of your budgetary secrets.

Like – how do you get speakers? Pay for your meeting room? Get books for your beginner's class? Obtain books and videos for your club's library? Offer the basic amenities . . . coffee, cream and honey, cups and napkins, plastic spoons . . . at meetings? What about a computer, projector and screen for meetings? Do you have an annual Banquet – or Summer picnic that your club contributes to, or pays for? And what about the club's bees, beeyard, equipment and ongoing annual costs for feed, new wax and the like?

Now some clubs earn a lot of their necessary funds, like our local group does, in ways other than collecting dues or charging fees. We sponsor a booth at the county fair where we sell honey and other bee products to fair goers and the club gets a small cut of everything sold. But we work hard and spend money on decorations, our observation hive, and other educational material we give out. There's a similar opportunity like the fair in the Fall we participate in most years, and we take some of that also. And of course we have occasional raffles. We solicit freebies from suppliers and raffle them off – a buck a ticket for a chance for a new super, hive tool or book. The giver gets a mention, the club gets a few bucks and one of the members gets a new toy. I have, however, seen some groups overdo that fund raising habit. They get so many items that individual items begin to lose value. A whole tableful of stuff – some expensive, some kitchy decorations, some stuff you don't know what it is, and soon it all tends to blur.

Some groups have equipment auctions – members bring in equipment they don't need and, after it gets inspected, there's an auction. The donor gets rid of stuff and gets some money, the buyer gets something cheap, and the club takes a chunk off the top to help keep going.

Some groups have a local bee supply dealer (or maybe several who all help out) who foots the bills, helps with the supplies and the room and AV equipment, and in turn gets a tiny bit more favorable eye when members need supplies, bees or advice. It works for both of them, usually. I've seen that not work so good for the dealer though. Beekeepers tend

Free?

to be a suspicious bunch sometimes, and only *imagine* the profit the dealer is making, not the donations coming their way. That hurts.

And I'm sure there are other non-dues ways that clubs raise money, and if the services the club offers with the money they are able to raise keeps old members coming and gets new members every year – the club in question has to limit their class to 50 people because it fills so fast and the (free) room only holds so many . . . how can you argue? It works for them.

I certainly can't argue with that kind of success, I guess.

But here's a thought. All of the services clubs offer – meetings, speakers, coffee, libraries, fair booths, classes – have a value to the people who use them, don't they? Do you expect all this for free every month, year after year? Do you put a quarter in the jar when you take coffee, creamer and honey at the meeting? What about borrowing that new book? For free?

And speakers. They give time, travel money, skill, and more time – for free? Just for you. Isn't there a value there? Even local speakers – the old-timer who knows more than anybody, he invests time and resources in mentoring and giving talks and bringing stuff and loading it up and getting it home. Time is money, you know. And gas is over $3 a gallon anymore.

I'm impressed that that group has managed to be a free resource to so many for so long. I hope they can keep it up and keep doing a good job at the price. They must be doing it right. I hope their members appreciate all that gets done.

•

Although we won't get the official USDA word until the end of February, it's pretty clear the U.S. honey crop is bust this year. From our survey of honey reporters we're predicting a pretty low crop, and some have said even lower than we predict (see our Honey Report this month for the numbers). That's incredible. But with the ban on honey with GM pollen in it forbidden to be sold in the EU, and Vietnam and India ramping up production . . . and who knows what China is up to . . . the supply of honey in this country this Winter is going to be volatile, expensive, cheap, hard to find, plentiful, mostly dark, all white, and mostly an unknown for those who need honey in large amounts on a continuous basis. Don't be too quick to set prices this Winter. It's a strange world out there.

If you're getting ready to move to almonds remember to keep you veil tight, your smoker lit and your hive tool handy. Maybe I'll see you in one of those orchards this year.

And from all of us here at Root Candles, and *Bee Culture* magazine, have a terrific Thanksgiving.

Kim, Kathy, Dawn and Amanda

NOVEMBER – REGIONAL HONEY PRICE REPORT

Time once again for *Bee Culture's* Annual Honey Crop Report. Last November, after surveying our over 100 field reporters…consisting of a representative population of commercial, sideline, backyard beekeepers and honey packers, we predicted a U.S. crop of 117,360,000 pounds, with average production per colony of 53.7 pounds…the smallest honey crop reported since reporting started. The USDA did their survey a bit later in the year and, reporting in February of this year, calculated a crop of 175,904,000 pounds, with average production per colony of 65.5 pounds, almost the smallest honey crop reported since reporting started. You know the drill on their figures though…some colonies get counted twice…there's some hitches, but they are consistent, so we work with them. Our figures were 58 million pounds apart, which is totally attributable to our colony estimates…we calculated there were 2.445 million colonies, while the USDA's figures were 2.684 million colonies…had we used their colony count our crop estimate would have been 132.156 million pounds. Conversely, had they used our (in our opinion more accurate estimate), their production would have weighed in at only 130 million pounds…so there you have it from last year.

This year, after thoughtful consideration, and extensive phone and personal interviews, we estimate the U.S. colony count to have decreased from last year's count by right about 20%...about 80% of that due to weather. That bumps the colony count…by our estimation, to 2,147,000 colonies.

As far as the crop goes, you can see the chart for average colony production per region, and the total at the end. But we have the average honey production from only the colonies that honey was harvested from, and we asked what the average was if they included the colonies that didn't produce any honey at all. The difference is significant, and we think worth noting when considering the total U.S. crop and colony counts.

So, how to proceed? Do we use the only-honey-producing figures, or the all-colonies figures? Well, we did a bit more digging with some of the commercial and sideline beekeepers we know, and we arrived at a compromise…when asked how many of their colonies, really, didn't produce honey, that were included in the total count done by the USDA, the figure we arrived at was right about 25% give or take. Applying that to the total colony count then would give us a realistic figure…so per colony production, when calculating for honey-only colonies, weighed in at 53 pounds per colony. This, times the adjusted number that was reduced by 25% from our total, gives a U.S. crop this year at 113.4 million pounds. An even smaller crop than last year.

I guess we'll just have to wait and see. In any event, there isn't much honey out there, or, there's even less.

Honey Production/Colony 2010																										
Regions	**1**		**2**		**3**		**4**		**5**		**6**		**7**		**8**		**9**		**10**		**11**		**12**		*Total*	
	A	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**	**A**	**H**
2009	30	-	37	-	37	-	33	-	70	-	72	-	32	-	57	-	83	-	57	-	54	-	83	-	54	-
2010	40	26	26	17	46	35	53	34	63	58	82	59	45	27	75	48	51	44	76	62	58	39	77	54	64	41
2011	46	35	58	35	42	34	34	26	54	30	78	64	45	34	78	65	41	33	52	32	42	28	61	38	53	38

A = all Colonies Counted
H = Only Honey Producing Colonies Counted

REPORTING REGIONS													SUMMARY		History	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**			**Last Month**	**Last Year**
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS													**Range**	**Avg.**		
55 Gal. Drum, Light	2.06	1.95	1.80	1.98	2.06	1.62	1.80	1.65	1.60	2.06	1.58	1.70	1.58-2.06	1.82	1.72	1.72
55 Gal. Drum, Ambr	1.74	1.95	2.00	1.51	1.74	1.68	1.73	1.65	1.80	1.73	1.67	1.78	1.51-2.00	1.75	1.63	1.54
60# Light (retail)	145.00	161.00	149.00	137.00	144.74	165.00	143.25	147.50	100.00	139.80	154.67	166.25	100.00-166.25	146.10	151.16	144.78
60# Amber (retail)	145.00	151.00	132.00	135.75	143.72	158.33	141.67	145.00	100.00	143.72	151.00	162.50	100.00-162.50	142.47	149.70	133.48
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS																
1/2# 24/case	63.36	71.48	48.00	58.80	70.84	60.00	44.00	70.84	70.84	48.00	57.00	87.00	44.00-87.00	62.51	63.58	63.43
1# 24/case	60.48	99.57	81.60	78.20	90.15	96.31	79.47	93.00	90.15	109.08	93.12	112.10	60.48-112.10	90.27	90.92	90.82
2# 12/case	50.97	81.85	75.90	68.50	67.31	77.76	73.13	84.00	60.00	81.00	84.00	81.25	50.97-84.00	73.81	78.59	75.63
12.oz. Plas. 24/cs	78.24	76.37	64.20	75.32	78.45	79.00	65.00	73.40	78.45	63.00	75.52	78.20	63.00-79.00	73.76	74.29	70.77
5# 6/case	56.40	98.98	89.25	78.90	71.92	98.00	78.40	102.00	71.92	77.10	88.08	90.33	56.40-102.00	83.44	86.89	88.01
Quarts 12/case	118.63	127.45	81.60	110.80	118.63	103.31	90.00	102.00	118.63	133.87	104.10	125.33	81.60-133.87	111.20	116.39	109.63
Pints 12/case	87.11	69.95	112.80	74.06	55.00	60.67	110.25	73.50	50.00	80.64	64.80	76.67	50.00-112.80	76.29	78.23	72.27
RETAIL SHELF PRICES																
1/2#	3.00	3.90	2.70	3.55	3.28	3.00	3.10	3.28	3.28	3.45	3.42	4.00	2.70-4.00	3.33	3.40	3.68
12 oz. Plastic	3.75	4.50	3.40	4.04	4.20	4.13	3.61	4.21	4.20	3.44	4.39	4.83	3.40-4.83	4.06	4.18	3.78
1# Glass/Plastic	5.50	5.19	5.20	5.21	5.77	5.62	4.42	5.34	5.77	5.31	5.30	6.25	4.42-6.25	5.40	5.54	5.05
2# Glass/Plastic	10.00	8.39	9.52	8.17	9.85	8.50	8.15	7.84	8.00	8.97	9.21	11.33	7.84-11.33	8.99	8.92	8.38
Pint	7.93	6.82	7.10	6.83	6.00	6.81	8.20	7.34	6.00	8.13	7.34	10.12	6.00-10.12	7.38	7.91	7.90
Quart	14.27	10.10	13.70	12.28	14.27	11.40	14.16	11.73	9.00	14.28	11.42	15.00	9.00-15.00	12.63	12.60	11.82
5# Glass/Plastic	23.75	18.94	18.95	20.75	22.05	22.00	17.10	22.00	22.05	17.59	19.23	23.00	17.10-23.75	20.62	18.93	18.87
1# Cream	6.20	6.32	5.95	5.73	6.20	5.75	5.35	6.20	6.20	5.65	6.62	7.00	5.35-7.00	6.10	8.96	5.93
1# Cut Comb	7.50	9.98	7.50	9.88	9.03	9.83	8.11	6.00	9.03	15.00	8.50	11.00	6.00-15.00	9.28	8.00	7.95
Ross Round	6.97	6.95	7.80	5.13	6.97	6.50	6.00	6.75	6.97	6.97	8.00	8.99	5.13-8.99	7.00	7.15	6.97
Wholesale Wax (Lt)	4.00	5.50	3.75	3.83	6.97	5.83	6.13	4.25	5.97	6.00	3.43	4.50	3.43-6.97	5.01	3.98	4.22
Wholesale Wax (Dk)	3.00	4.98	2.75	3.55	4.61	4.43	4.33	4.00	4.61	4.61	2.75	4.00	2.75-4.98	3.97	3.60	3.43
Pollination Fee/Col.	90.00	112.50	75.00	53.83	89.94	66.67	55.00	75.00	89.94	89.94	58.00	107.50	53.83-112.50	80.28	71.83	82.89

A Closer LOOK

HONEY BEE LONGEVITY

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

Caste differentiation for larvae that become queens or workers has been associated with the quantity and quality of food that larvae receive before the third larval instar.

Honey bees are eusocial insects that exhibit striking caste specific differences in longevity, thus have become promising subjects for the molecular study of aging. Eusocial insects are characterized by overlapping generations of adult colony members, a system of caste division (reproductive vs non-reproductive individuals) and cooperative care for young colony members (Wilson 1971). All honey bee castes exhibit different developmental times and life spans. Drones have a developmental time of 24 days, and they live on average 21-32 days in the Spring and Summer, the only times when drones are produced (Winston 1987). Drones under some conditions can live at least 59 days (Page and Peng 2001). Workers develop in 21 days and their life spans vary depending on season. Workers live on average 15-38 days in the Summer (Free and Spencer-Booth 1959), 30-60 days in the Spring and Fall, and 150-200 days in the Winter (Remolina and Hughes 2008). Queens take the shortest time to develop (16 days) and have the longest life span. Queens in a commercial hive are generally replaced after one to two years (for productivity reasons) and have adult life spans of two to five years (Sammataro and Avitabile 1998) with the longest recorded lifespan for a honey bee queen being eight years (Bozina 1961 cited by Page and Peng 2001).

Caste differentiation for larvae that become queens or workers has been associated with the quantity and quality of food that larvae receive before the third larval instar. Larvae fed a rich diet composed of royal jelly develop into queens, whereas larvae fed a diet composed of glandular secretions, honey, and pollen develop into workers (Winston 1987). The dimorphism observed in the honey bee female caste is particularly interesting because workers and queens have the same genotype yet exhibit a 10-fold difference in life span. Physiologically, queen-destined larvae have high levels of juvenile hormone (JH), which prevents ovarian apoptosis (a pattern of cell death) in 5th-instar queen larvae. JH levels have also been implicated in upregulating ecdysteroid titers, which, in turn, activate transcription of genes that direct differentiation to the queen pathway (Page and Peng 2001). The insulin signaling and TOR (target of rapamycin) pathways act as central regulators in queen-worker differentiation (Wheeler et al. 2006, Patel et al. 2007).

Worker honey bees undergo age development after they become adults. Workers usually initiate foraging behavior when they are two to three weeks old. The age at which a worker initiates foraging is a strong determinant of her length of life. This is presumed to be a result of the hazards of foraging, but natural senescence also occurs (Page and Peng 2001). Senescence can be defined demographically as an age-dependent increase in mortality risk, or functionally as a decline in performance. The relationship between the two phenomena is central for understanding the biological aging process (Rueppell et al. 2007b).

Studies of senescence in the honey bee have focused on establishing the importance of extrinsic mortality factors (predation, weather)

"Senescence can be defined demographically as an age-dependent increase in mortality risk, or functionally as a decline in performance."

and behavior (nursing and foraging) in worker honey bee longevity. Senescence can be delayed or speeded up by preventing workers from leaving the nest or forcing them to do so earlier (Rueppell et al. 2007a). Hive bees, which are prevented from foraging, can live over eight times longer than foragers (Neukirch 1982, Rueppell et al. 2007a, Amdam et al. 2004), and non-flying Winter bees in the 'diutinus stage' (stress resistant form) can live up to eight months (Amdam et al. 2004, Omholt and Amdam 2004). Senescence obviously starts with foraging: workers show a decline in physiological resistance to stress, such as heat, desiccation and starvation (Remolina et al. 2007) and their hemocyte count drops (Amdam et al. 2005), while their behavioral performance appears to remain unchanged (Rueppell et al. 2007b).

The nurse-forager transition appears to be orchestrated by JH, which exhibits an age-related increase in worker bees: nurses have low levels of JH and foragers have high levels of JH (Robinson et al. 1991). Nurses also possess well developed hypopharyngeal glands used in feeding other colony members (Winston 1987) and have high levels of abdominal lipids or fat body (Toth and Robinson 2005) and vitellogenin (Rutz and Lüscher 1974, Corona et al. 2007). In contrast, bees emerging in the cold season ("Winter" bees) have a different physiological profile than bees emerging in the Summer. Winter bees possess well developed hypopharyngeal glands, high vitellogenin levels and low levels of JH (Fluri et al. 1977).

Ribbands (1952) reported that bees that begin to forage later in life have shorter foraging careers and attributed this pattern to intrinsic senescence. Measurement of glycogen levels in free-living bees led Neukirch (1982) to propose that older foraging workers undergo a physiological change that directly affects life expectancy. Neukirch suggested that young foragers can replenish glycogen reserves, but that this ability is impaired in older foragers that exhaust their energy supplies and die in the field. Using experimental manipulation of foraging opportunity, Schmid-Hempel and Wolf (1988) found that workers had fixed life-spans regardless of time spent outside the hive, and concluded that

"Hive bees, which are prevented from foraging, can live over eight times longer than foragers and non-flying Winter bees in the 'diutinus stage' (stress resistant form) can live up to eight months."

lifespan did not depend on extrinsic mortality. In a study in which workers were trained to visit an artificial flower to collect food, and thus protected from extrinsic mortality, old foragers took longer to collect food and fly between the hive and artificial flower, again suggesting that foragers experience a decline in flight performance due to senescence (Tolfiski 2000).

In contrast, survival analysis of free-flying bees of known age indicated that although locomotor performance declined after about ten days of foraging, most bees (79%) died before reaching this age (Visscher and Dukas 1997). Moreover, mortality rate was constant with age in these bees. These observations led the authors to conclude that lifespan in these bees was limited by predation or other sources of extrinsic mortality.

In an explicit effort to compare intrinsic vs extrinsic mortality factors in the determination of worker lifespan, Rueppell et al. (2007a) compared the lifespan of workers that foraged in a protected environment (flight cage) and workers that foraged in a natural setting. They also varied the amount of time bees were allowed to forage in a flight cage. Free-foraging mortality was higher than flight-cage mortality, but both groups showed increasing mortality rates with age consistent with senescence. Limited foraging opportunities in the cage had no overall effect on lifespan. There was also a negative correlation between age at first foraging and foraging lifespan, suggestive of pre-foraging senescence. In a separate study, Rueppell et al. (2007b) assessed age-dependent mortality and behavioral performance of foragers. They found that workers experienced an increase in mortality with chronological age, but their performance in behavioral assays related to foraging activity did not decline with age.

To eliminate the confounding effects of increased extrinsic hazard and energy expenditure faced by foraging bees, Remolina et al. (2007) used a social manipulation to prevent nurse bees from transitioning to foraging. They tested whether older nurses were more susceptible to different kinds of stress: starvation, heat and oxidative damage. In this study, all forms of stress resistance decreased in older bees, and this manifestation of senescence was evident by 30 days of age. They therefore concluded that intrinsic senescence affects nurse lifespan independently of extrinsic mortality force. Although there are a few contradictory reports, overall the evidence supports the proposition that worker bees (both nurses and foragers) exhibit senescence.

With the exception of the mating flights queens take early in life, they do not leave the protected hive environment except during colony swarming. Adult queens are protected from predators and environmental extremes by the physical structure of their nests and defensive behaviors of non-reproductive workers, which may increase their chances of having a longer life span. The physiological and molecular basis of queen longevity and the dramatic lifespan differences between queens and workers is just beginning to be explored. Several proximate mechanisms for the differences in worker/queen longevity have been proposed; Remolina and Hughes (2008) reviewed three of the more prominent suggestions: oxidative stress defenses, immunocompetence and endocrine signaling.

The oxidative stress theory of aging (Harman 1956) states that cumulative oxidative damage causes aging and that lifespan is inversely related to the rate at which damage occurs. Therefore, a long lived organism, such as the queen honey bee, should have a lower rate of reactive oxygen species (ROS) production, eliminate ROS more effectively, or better repair oxidative damage in order to minimize accumulation of damage. Reactive oxygen species, also commonly referred to as free radicals, are continuously formed in cells as a by-product in metabolic reactions. Such radicals can damage lipids (fats),

"Intrinsic senescence affects nurse lifespan independently of extrinsic mortality force and worker bees (both nurses and foragers) exhibit senescence."

proteins and nucleic acids. If these damaged molecules are not quickly eliminated by detoxifying enzymes such as superoxide dismutases and catalases, they will accumulate (De Loof 2011). Corona et al. (2005) compared young and old queens and workers with respect to mRNA levels of eight antioxidant genes and mitochondrial proteins involved in cellular respiration in different tissues (head, thorax and abdomen). Antioxidant and respiratory gene expression decreased dramatically with age in queens, increased or remained unchanged with age in workers, and were generally substantially lower in old queens than in old workers.

Corona et al. (2007) compared paraquat resistance in queens and workers of similar age and found that queens were much more resistant to this form of oxidative stress. While workers are experiencing senescent decline in stress resistance by 30 days of age, and are not expected to live much longer, queens are highly stress resistant and expected to live more than 10-fold longer.

A general feature of aging in animals is the deterioration of immune efficiency, or immunosenescence (Solana and Pawelec 1998). Insects possess cellular and humoral immune mechanisms that identify and eliminate foreign tissue and pathogens. Cell-mediated immunity involves hemocytes, which are able to recognize and phagocytose foreign bodies present in the hemolymph. Hemocytes also have the ability to form groups that incapsulate large foreign bodies and nodules to trap invading bacteria. In addition to cell-mediated immunity, bees synthesize antibacterial peptides in the fat body in response to microbial infection. Amdam et al. (2005) reported that honey bee foragers have reduced hemocyte numbers and higher microbe and nodule numbers compared to nurses, but concluded that this difference was influenced more by behavioral role (possibly mediated by exposure to pathogens) than by age. That conclusion was based on a social manipulation that forced foragers to reverse to the nursing stage. This manipulation resulted in reverted (old) nurses that were physiologically similar to normal-age nurses (low JH titers, high Vg titers, enlarged hypopharyngeal glands) and had higher hemocyte counts than foragers of the same chronological age.

In contrast, Schmid et al. (2008) reported that hemocyte numbers decreased with age in queens, workers and drones, and that old nurse bees and foragers have lower hemocyte numbers than their young counterparts, suggesting hemocyte decline is not task-but age-dependent.

Endocrine signaling involves the insulin insulin-like signaling (IIS) pathway which regulates metabolism, development, reproduction and longevity in numerous organisms. Insulin signaling has been suggested to be a key determinant of lifespan differences between honey bee queens and workers (Corona et al. 2007). Recent studies suggest that the IIS pathway interacts with vitellogenin and juvenile hormone to regulate honey bee lifespan, and these interactions may provide the key to both the long life and high fecundity of the queen. In honey bees, JH and Vg abundance are negatively correlated: low levels of JH in the queen allow Vg titers to build up, whereas high levels of JH in foragers causes Vg titers to drop (Fluri et al. 1981, Hartfelder and Engels 1998). BC

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"Antioxidant and respiratory gene expression decreased dramatically with age in queens, increased or remained unchanged with age in workers, and were generally substantially lower in old queens than in old workers."

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Managed Pollinator CAP
Coordinated Agricultural Project

Virus & Varroa
The Targets

Greg **Hunt**, Dave **Shenefield**,
Krispn **Given**, Jennifer **Tsuruda**

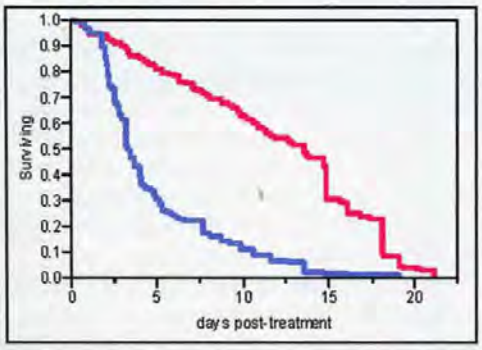
An Update On Bee Breeding Efforts In Indiana

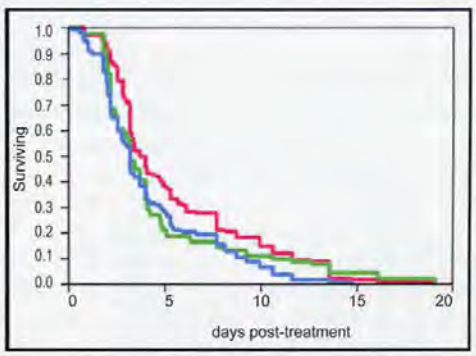
Breeding for resistance to Israeli Acute Paralysis Virus.

According to the most recent surveys in North America and Europe, *Varroa* mites still appear to be public enemy #1 for bees, at least among the factors that were measured (Currie et al. 2010; Dahle 2010; Guzmán-Novoa et al. 2010; Peterson et al. 2010). *Varroa* mites transmit viruses to bees and also can suppress the bee immune system, causing latent viral infections to amplify which results in parasitic mite syndrome. Viruses can also be transmitted in the absence of mites and can often be detected in bees that appear perfectly healthy. Deformed Wing Virus (DWV) is a very common virus associated with mites and colony decline. Most of our colonies at Purdue already have DWV that we can detect by molecular tests, but the bees appear fine. As part of the Purdue University effort for the honey bee health CAP, Jennifer conducted experiments to try to select for bees that are resistant to Israeli Acute Paralysis Virus (IAPV). She inoculated bees with IAPV in cages through feeding. IAPV is one of the viruses transmitted by *Varroa* and has been associated with rapid colony declines. A sample of mostly IAPV obtained from the Purdue University Bee Lab was mixed with sugar syrup and fed to bees. IAPV has a dramatic effect on the life expectancy of bees in cages.

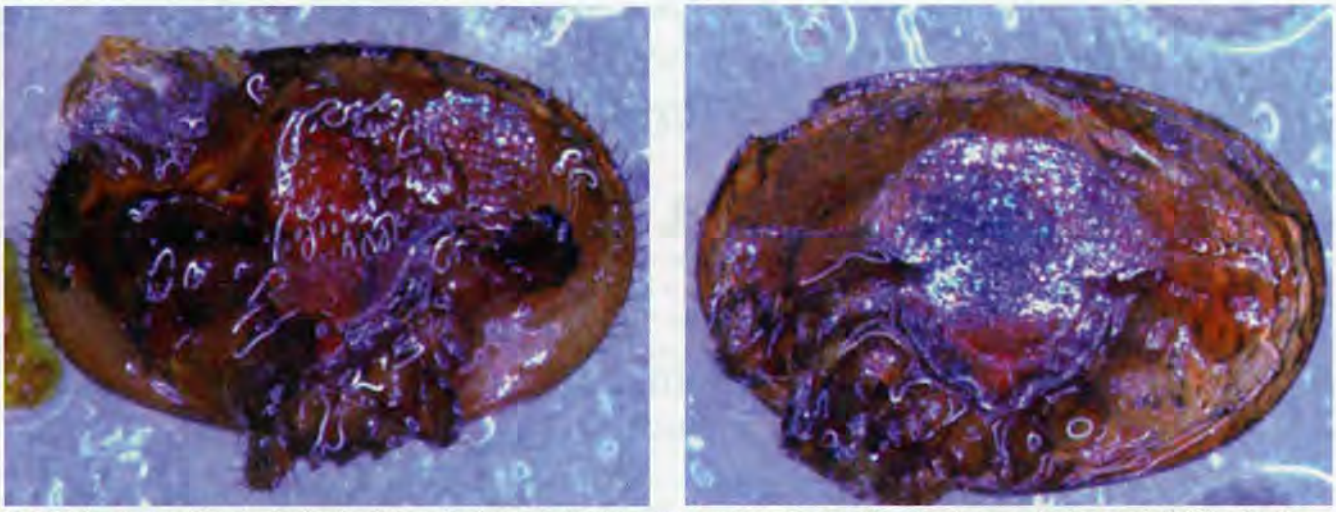
Krispn Given, top and Dave Shenefield practice instrumental insemination at the Purdue Bee Lab.

Bees from many of our colonies were tested by emerging brood in an incubator, marking the bees with paint to distinguish the hive they came from, and keeping them together in cages to be fed sugar syrup, or sugar syrup + IAPV. The sugar syrup contained MegaBee protein supplement for the first three days. When the bees were three days old, half of the cages got virus in their sugar water. Last Fall after these tests, we selected hives that looked relatively susceptible and others that looked more resistant and used instrumental insemination to cross a susceptible hive to another susceptible hive, and also resistants





Left: IAPV kills bees. Bees kept in cages and fed plain sugar syrup (red lines) survived longer than bees fed sugar syrup plus IAPV (blue). Right: After inoculating bees with IAPV in sugar syrup, bees from two hives established from crosses between susceptible sources (green and blue) died faster than bees from the resistant x resistant cross (red).



Rarely do we see bites to the body of the mite, but missing legs are common. By counting the damaged mites and dividing by the total number of mites, you can get a measure of the level of grooming activity in a hive.

to resistants. This Spring, the progeny of these crosses were tested and after averaging three different sets of tests, the resistant cross bees did live a little longer than the susceptibles (Figure 1). But we are discouraged that we did not make more progress and have not repeated these laborious tests. This line of research has multiple problems for us. The biggest one is that our hives have varying levels of mites and viruses to begin with and even newly emerged bees often have virus. Another problem is that our inoculum contained not only IAPV, but detectable levels of DWV. Each type of virus can also have different genetic variants that appear in certain regions of the country. Perhaps we should let natural selection help us to get virus resistant bees by just breeding from the healthiest survivors within a geographic region.

Breeding for resistance to *Varroa*

In North America, some bees are fighting back against mites. Two traits in honey bees have been shown to reduce mite populations. Some bees are good at removing mites from brood, and some are good at removing mites from adult bees. The first trait, *Varroa* sensitive hygienic behavior or VSH, involves bees removing or uncapping sealed brood that is infested with mites. The USDA Baton Rouge Bee Lab has developed the VSH stock and it has been made available commercially. The other trait is grooming behavior - we are working on increasing the mite-biting behavior in our bees. We developed a lab assay to sample bees from hives and determine how many mites they remove from themselves in three days (Andino and Hunt 2011). We showed that these results correlate with the proportion of chewed mites that fall on a sticky board placed on the bottom board, so both methods can be used to measure grooming behavior. The results also showed that mite-biters had fewer mites on the adult bees. We are using the proportion of chewed mites as our selection tool and breeding from colonies that have higher proportions of chewed mites (see Figure 3). Anyone can do this as long as they have something to magnify the mites about 15X. Usually only legs are missing from the mites. We began in 2007 by looking at just 22 of our hives and found an average of 3% chewed mites on the sticky boards. The highest proportion bitten was 8%. We raised queens from this hive. We have been continuing the selection and have made crosses by instrumental insemination between the best mite-biters. This year we looked at 65 of our colonies and they had an average of 15% chewed mites and many colonies had over 40%, a five-fold increase in grooming behavior! We would like to expand our selection to colonies among commercial operations in Indiana to have a bigger population to select from. Crossing mite-biters with VSH breeders should increase mite resistance even further.

Rarely do we see bites to the body of the mite, but missing legs are common. By counting the damaged mites and dividing by the total number of mites, you can get a measure of the level of grooming activity in a hive.

Encouraging "microbreeders".

We think it is important that some of the more experienced beekeepers learn how to raise their own queens and do their own selection. The more people doing this, the better we will be able to breed bees that are adapted to local conditions and are resistant to mites, and more breeders means more diversity in our bee population. This year, Dave got a grant through the Indiana Department of Agriculture to increase our ability to raise and distribute queens – an Indiana queen project, similar to what are neighbors in Ohio and Illinois have done. We have had a rocky start this year, but it is a start! The biggest problem was the cold rainy spring weather, which did not allow us to raise many queens until June. But Dave went to a number of local beekeeping associations to get them organized, so that if a number of beekeepers wanted breeding stock from the program the club could send one person to go get queen cells or queens. A part of the cost goes back into the program for next year. We were able to distribute about 300 cells and a few breeder queens, far fewer than our goal of 1,500 cells, but the important thing is that we are set up and ready for next year.

For the past three years, members of the honey bee health CAP have been conducting queen-rearing shortcourses. We had two of these in Indiana this year at the Heartland Apiculture Society conference, thanks to Larry Connor, Krispn Given, John Skinner and Mike Wilson. The theme of the HAS conference was "helping

bees to help themselves: breeding healthy bees." There were also demonstrations on how to test bees for hygienic behavior and mite-biting behavior. Joe Latshaw gave an instrumental insemination (I.I.) demonstration. Later in the season, Krispn conducted an I.I. class at Purdue for a few participants in the queen project. We are excited about what seems to be new interest in breeding in the Midwest and are looking forward to next year! BC

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Catching, Marking, Caging, Storing And Releasing Honey Bee Queens

James E. **Tew**

The final phase for a new queen as she begins her career at a new site.

Getting comfortable handling queens

Like so many other aspects of beekeeping, confidence and comfort when catching and handling queens only comes after you have caught and handled queens over time. The chances are very good that even a novice will not actually crush a queen simply trying to catch her. What about stings? Queens can sting and, yes, the sting feels like a good, meaningful sting, but – in my modest experience – it rarely happens. Depending on the age of a queen and her demeanor, a greater concern than stinging is her taking flight and becoming lost. Even if you don't take on the task of producing queens, in your beekeeping endeavor - sooner or later - there will be common occasions when handing a queen becomes necessary. Handing and manipulating queens is not really that difficult.

Finding queens

Finding the queen in a colony can be a problem. *(I am immediately inclined to sarcasm.)* If you really want to find the queen, then just don't look for her, but rather just look for anything else. Time and again, it feels as though I see the queen when I am not searching for her and I generally see her when I have no reason to catch her. Yet, if I am in need of her, and diligently searching for her, it is as though she is not even in the same country. What gives?

A queen with a numbered plastic disk as a marker.

I recently read an article[1] on subconscious brain functions that was only one of several that I have read on the subject. Essentially, the concept is that my unconscious brain function is more significant than my conscious awareness (in many ways). It seems that the unconscious part of my brain has been given a hefty assignment – coordinate breathing, heart beating, bile production, hair growth, digestion, skin replacement . . . and on it goes, but finding a honey bee queen? Oh, yes, at this point, I admit that I am making a broad jump from the tenets of the article to any effort directed toward finding a queen.

My belabored point is, *"when searching for the queen, calm down and let your subconscious mind help."* Don't be racing the other person who is also looking. Don't be anxious because you have already been through all frames one time already. If practical, separate and isolate the individual hive components of the colony. If you begin at the top of the hive, there is a good chance the queen will move away from all the commotion as you remove frames and search. She will steadily move down – requiring you to go through even more equipment. Don't set individual components on the grass. Use extra bottom boards or outer covers. Don't begin with the centermost frame. There's too much of a chance that you will roll the queen off as you remove the first, tight frame. Once an outside frame has been removed, remove additional frames as you just calmly look for her – over and over again. Didn't see her? Then check the sides and the little clusters of bees in the bottom board corners. She's there somewhere. Don't get anxious. She always turns up.

Catching and handling queens

There are quite a few reasons a beekeeper may have to catch a queen, but since the focus my present *Bee Culture* series has been queen biology and production, I will use the common need to remove the queen from a nucleus colony as the reason for catching and handling a queen.

As is so often the case, new queen handlers can practice on drones. They are larger, more sluggish, and they don't sting. See if you can grab the fellow by both

[1] Eagleman, David. (2011, September 8). **Your Brain Knows a Lot More Than You Realize**. *Discover Magazine*, http://discovermagazine.com/2011/sep/18-your-brain-knows-lot-more-than-you-realize/?searchterm=subconscious

wings (probably with your right hand), then grasp the drone with your thumb and forefinger of your left hand with your thumb on the top, and your forefinger on the bottom. You will then be holding the drone by his thorax. Once you feel comfortable with this practice procedure, try it on your queen. Choose your spot when she is in the open and not surrounded by workers or comb. Be decisive. Give it a shot. If you miss, back off and wait for another opportunity. Don't keep jabbing and don't press the queen onto the combs to catch her. Her head and thorax are pretty tough but her abdomen is soft and easy to damage.

Be prepared. She will be squiggly and struggling to escape. A stray leg or wing may be twisted in an awkward position. Do whatever it takes to make the situation correct. If you are new to this, you will be worrying about being stung and fearful of hurting her. Ultimately, you will become confident, but even experienced handlers don't become cocky. Experienced queen handlers are respectful and always careful when handling a valued queen.

Clipping and marking queens

Clipping a wing

Marking queens with a colored dot of paint or an adhesive dot is a common practice while the procedure of clipping queens has – for the present time – faded as a queen management recommendation. Who knows? As urban beekeepers continue to bring bee hives to town, the practice could, if needed, be revived. Essentially, the practice was to clip off the end of one of the queens larger wings; only the tip – maybe 1/8" or so. Clip too much and the queen could be viewed as damaged by the nurse bees. Don't clip enough and she will still be able to fly. Practitioners of this procedure also recommend clipping a right wing in even years and the left wing in odd years. The purpose of clipping was to keep the swarming queen from flying too far or too high, making the swarm easier to retrieve. If this procedure is revived, I and others like me will readily write about it, but just now, it should be enough to say that, yes, it does help keep the swarming queen nearer the ground, but on occasion, the swarming bees will not find the queen on the ground and she cannot return to the colony. It is not uncommon for the mutilated queen to be superseded. Clipping a queen makes her a very poor flyer – if she can fly at all. I have never liked the procedure but I don't like my swarming bees landing on my neighbor's property either.

Marking a queen

No doubt, worker bees do not care for the paint odor of a freshly marked queen, but marking seems to be less obtrusive than clipping. Marking a queen is a very helpful queen management procedure. A mark can give the general age of the queen and reassures the beekeeper that the original queen is still on the job. Gadgets are available from bee supply companies for holding the queen while marking.

A beekeeper-made box for banking queen. Individual queens were confined in each screened hole.

Marking pens or model car enamel can be used to make the mark. Some beekeepers have used products like colored *Liquid Paper®*. (***Ed. Note**: if you use this material, remove the bristles of the brush and simply put a 'dot' on the center of her thorax.)* Adhesive colored, numbered plastic dots have also been available for many years.

The color code for marking queens is recommended but a mark of any color is better than no mark. The Alabama Beekeepers Association produced a refrigerator magnet with the queen standard color information.

Use only a small mark. Allow the mark to thoroughly dry before returning the queen to the colony and don't get paint on anything but the queen's thorax. As usual, practice on drones (but with a different color).

Queen mark colors based on year-ending numbers.

Queen banks

A queen bank is a specialized frame or hive body where extra caged queens are stored until needed. There are no standard styles of banks. Placing queens in a queen bank is a common practice later in the queen season. Queen producers cannot produce enough queens in the early spring when demand is high but later the demand drops off and harvested queens must be stored somewhere so nucleus hives can be utilized to their full potential.

A queen bank is a colony of bees (either queen-less or queen-right) in which mated queens are placed for a period of time – usually until they are sold. In the queen-less queen bank the queens can be stored almost anywhere in the hive. The queen cages are placed in special frames designed to hold the style of cage the breeder is

Another Ed. Note, after talking to Dr. Tew

If you hold the queen when marking her, you'll notice that you'll most likely need your regular writing hand to hold the marker, and your other to hold the queen. Some people never can make that happen, but here's one way that can work.

Pick up the queens as before, using your right hand (if you're right-handed) with your thumb on the top and index finger on the bottom of her thorax. She will be wiggly. Be patient.

Bring your hands together, and with your left hand, using the long sides of your first digit of thumb and forefinger, thumb below forefinger grasp all three legs on the outside of the fingers holding her. Not one, or two, but all three. When you have them all, slowly release her from your right hand. Be patient. She will calm down.

Then you can easily mark her with your normal writing hand. Be patient. Let the paint dry.

When it's time to move her, regrasp her with thumb and forefinger, bottom and top of thorax, and move her to . . . a cage, frame, wherever she is to go.

using. The bees in the hive will feed the queens and keep them alive.

A queen-right hive used as a queen bank requires some separation between the brood chamber which holds the queen and the area of the hive where the mated queens are kept. A queen excluder is usually placed over the brood chamber followed by a honey super and then the super that will hold the queen frames. With a queen-right colony this works well until cold weather sets in when the bees will return to the brood chamber and abandon the banked queens. This happens often when beekeepers buy a hundred queens or so and place them directly above the queen excluder until they can get them into hives for splits or requeening. A large number of those queens die because during cold nights etc. the worker bees will leave them unattended.

What is good about a queen bank?

It allows the beekeeper to utilize nucleus (aka *nuc* hive) hives when demand for queens is low or to hold a large inventory of queens after the season has ended.

What is bad about a queen bank?

Queens placed in a queen bank are not laying eggs and generally lose weight as a result of not being a productive egg layer. This causes much stress on the queens. It is unnatural for a queen to exist in this condition during the Summer months. It may be one of the reasons for a great deal of supersedure in modern queens. The best queens sold are large and placed under stress for a very short period of time – the time from being taken from the nuc until they are introduced to a hive as the queen mother.

Queen cages

The most common queen cage is still the Benton three-hole cage, but I should rush to say that a host of plastic cages are available and many have desirable attributes. A queen cage can be an old styled match box or an empty drink cup, but for longer term storage, proper cages are required. For a comprehensive review of the multitude of queen cage styles, see: **http://www.dave-cushman.net/bee/queencages.html** and **http://go.osu.edu/E22**. (See Below[2]). Currently, when it comes to queen cages, you get to decide which style you like best.

Introducing queen bees into colonies

There are incredible numbers of ways to introduce queens and absolutely none are foolproof. Two common techniques, having different levels of complexity, follow. In both instances, the old queen much be removed. Do with her as you wish, but she can't stay in the colony.

Complicated way that I have used

If I have a queen that is particularly valuable to me, I will proceed by using a fairly clumsy technique. Using eight-mesh hardware cloth, I improvise a cage that is 4-6" square and about ¾" deep.

I remove a frame of capped brood and shake off 90% of the bees (the remaining bees will be young nurse bees). Working under screen netting or working at a screened window, I trap the queen underneath the cage with a few young worker bees by pressing the cage into the comb over the capped brood. The young worker bees in the cage are optional. Yes, some pupae will be killed. I remove an outside frame to give me plenty of room in the center of the colony and I return the caged queen into the colony proper. I check the cage in about two to three days to see if bees are still acting aggressive toward the cage and determine how many young nurse bees have emerged with the queen inside the cage. At four to five days (six to seven days is not bad), I open the colony with the least amount of smoke and gently remove the cage. Using the netting is an excellent idea if this is a particularly expensive queen. I will then do nothing for a week other than checking at the entrance to see if the queen has been ejected. After a week, I will check to see if eggs are present. If they are, leave the colony alone for four to five more days before beginning to treat the colony normally.

A less complicated way that I frequently use

With a queen that is less valuable to me and working under netting or working near a screened window, I put the queen back into a common three-hole queen cage. No feed is required. I suspend the queen near capped brood and nurse bees. Follow the same timeframe as above, but don't leave the cage in any longer than necessary. If no candy plug is present, the queen will have to be released manually. Bees will build burr comb in the extra space caused by the cage. In all cases, bees will treat the cage as they will treat the queen given the chance. If they are clinging to the cage, do not release her. Give the caged queen more time to be accepted. If the worker bees are calm and quiet, releasing her should be okay.

General suggestions for queen introduction with a traditional cage

1. Be absolutely certain the colony is queenless and that any developing queen cells have been destroyed.

[2]If links become inactive, search (1) Dave Cushman, England and (2) Walter T. Kelley Co. at: https://kelleybees.com/Products

2. Allow the colony to stay queenless for a day or so but not much more than three days.
3. If possible, allow the queen to be caged within the colony for about two - four days.
4. To release the queen, place the cage between the frames with the screen side down and with the candy plug exposed near the vicinity of young bees and brood.
    a. Allow the bees approximately two days to release the queen.
    b. Remove the cage as soon as possible to prevent burr comb from being produced in the space around the queen's cage.
5. If the queen is to be manually released, watch the surrounding bees to determine if they are clinging tightly to the cage in which the queen is confined.
    a. If they are showing aggressive behavior, do not release the queen until the surrounding workers act passively toward the caged queen.
    b. After releasing the new queen manually, watch the surrounding workers to see if they react hostilely to the new queen as she explores the comb on which she was released.
    c. If possible, don't open the hive again until the queen has had time to develop a brood nest of her own (about five to six days).

Simple, homemade queen cage (eight-mesh hardware cloth).

Yet another personal note

I am developing a web presence at: **www.onetew.com**. Everything is under construction but by the time you get this, I should be back on both YouTube and Facebook. At this point, my .com address is a lot like a new house – all empty and with an echo. I will work to make it a site with which you and I can communicate about bees and stuff. I am eager to get on with the next phase of my bee life.

Thanks,
Jim

Dr. James E. Tew, Alabama Cooperative Extension Service – Consulting Professor, Auburn University, www.onetew.com; tewbee2@gmail.com. facebook

HONEY COLORS

Jim **Thompson**

In the 1950s the United States Department of Agriculture developed the seven color classes of honey. The USDA developed a two rack device that contained the six color break points for honey and some small jars for samples, used to determine the color class. The sets of racks were accurate because they set the standard but unfortunately they contained many small pieces that are usually misplaced.

Thereafter the pfund color grader became the color authority for United States honey. It contains a triangular tray to put honey in and one can read the color thickness in millimeters. This machine is very accurate but the parts and the machine are very expensive. Due to its size, it is primarily a laboratory type instrument.

The Lovibond Color Comparator has several models; two are used by honey judges. The early model had 10 mm cells. It is a portable machine similar to a view master and considered to be accurate. The down side of this machine was that it was also expensive and the additional glass cells were $30 each when available. On the positive side only a small amount of honey is used in the sample. The later Lovibond Color Comparator is a 33 mm machine. This means that the glass gauging disc is calibrated for the thickness of the 33 mm's cells. The honey used in the sample is three times greater and the accuracy is the same as the early model. Many judges have a practice of holding the gauging wheel against the Gamber Classic Jars or the Queenline jars to get a color approximation, compromising the accuracy.

Another color comparator that is available is the Jack Scale. You fill a white plastic container with 10 mm of honey and move it around the colored sheets on a white background. You must position yourself directly over the sheets and use it in a well lit area. Its accuracy depends upon the skill of the operator and is an inexpensive way to check the honey's color.

There is a digital machine that will analyze the color of the honey and will give you a millimeter reading. It seems to be accurate but is expensive. It uses glycerin to zero the machine, thus you may need to find a source for glycerin if you plan to use the machine on several different days. I find that it is best to keep a vial of glycerin on hand to zero between readings. If the machine is not used constantly, it will turn itself off.

In 1985, I developed a color grading system using six jars, corn syrup, and the two Karo syrups, light and dark. The jars were in one pound Queenline jars. I used a Pfund color grader and mixed the syrups to equal the break points between the color classes. Then the hobbyist beekeeper could compare his/her honey sample to these "standards." Obviously this test was meant for an individual to get an approximation. There are many variables including the type of jars used. The color of honey in a Gamber Classic jar is lighter in color than honey in a Queenline jar. The batch of 1985 Karo syrup may be different in color than 2011 Karo syrup or other brands. There is a skill acquired by an individual to decide on whether their sample is lighter or darker than the test jar. I have stressed many times that these jars are an approximation in color. However different individuals have built light boxes that allow an individual to put their honey jars next to the test jars. It gives an immediate color test without pouring or dipping honey samples.

Several large honey shows have adapted this color grading system. The people in charge of the shows have gone to this system to allow them to enter the honey samples


USDA Model


Pfund Grader

Lovibond Color Comparator


Jack Scale

Digital Scale

Color Break Points	Pfund reading	Lovibond 10 mm	Jack Scale	Hanna Digital
8	8	Approx. 7	7.5	12
17	17	17	35	25
34	34	34	47.5	33
48	48	48	65	49
83	83	83	90	78
114	114	114	117.5	110

into the proper classes quickly. In using this system there needs to be a change in fair rules. First, an exhibitor may only enter their honey in the proper class according to the test jars. Second, the fair rules should prohibit the judge from checking the honey with some other type of color testing device. Gone would be the days where an exhibitor would be allowed to enter the same color sample in each class. When the exhibitor was in the wrong color class, they would simply loose points.

Another eye opener in the color reading devices has been finding that the different color testers do not correspond completely.

You would expect the Pfund readings and the Lovibond 10mm readings to be fairly equal because the syrups were mixed to match. It is not so surprising to see the variation in the Jack scale as it is very difficult to match a liquid color to a printed color. The digital readings are interesting as they are close in most cases to the other readings.

There are differences when the sample tested is warm or cold. Another variable in the difference of colors is just how full the dark measuring cups were filled? Do you allow 1/32th" at the top to allow pouring, or do you fill the cups to the top and risk spilling? Originally it was thought that the syrups would change color over time. The 1985 sample still looks good color wise today in 2011. However, there has been some top mold on one of the jars.

I made a completely new set of break point jars using 2011 Karo Syrups. The dark syrup measured less than the 1985 syrup. Therefore you would expect the mixtures to be slightly different. This time I used Gamber Classic one pound jars. I found that the mixture of syrups had a wispy appearance when cold. By heating the jars in a microwave for 35 seconds, the warmed jars could be shaken and mixed thoroughly. Some of the mixed syrup jars had to be altered to get them back into the proper color spectrum.

Jar One, determines the break point between Water White and Extra White honey and contains corn oil straight from the Wesson jar. It appears that other brands of corn oil are the same but you should stay away from vegetable oil, peanut oil, canola oil, and other oils as those oils were not tested. This jar lid should be marked 8 mm.

Jar Two, is the break point between Extra-White and White and should be marked 17 mm. The original mix was ¼ cup of dark syrup and filled to the middle of the neck ring with light syrup. It was too dark so ¼ cup of the mix was removed and more light syrup added. It was still too dark so another ¼ cup of the mix was removed and the level was again brought to the neck ring. The final mix read 17 mm on the Lovibond and 25 on the digital color analyzer.

Jar Three, is the break point between White and Extra Light Amber and should be marked 34 mm. The mix for this jar should have 1/3 cup of dark syrup the rest being light syrup.

Jar Four, is the break point between Extra Light Amber and Light Amber and should be marked 48 mm. Add a ½ cup of dark syrup and fill the rest of the jar with light syrup. The result is slightly dark so three teaspoons of the mix could be removed and light syrup added to the jar.

Jar Five, is the break point between Light Amber and Amber and marked 83 mm. This jar contains a 50% dark and 50% light syrup mix. Another way to make this jar is to add 2/3 cup of dark syrup and 2/3 cup of light syrup. It appears to be 83 mm in the Lovibond grader but measures 78 mm by the digital analyzer.

Jar Six, is the break point between Amber and Dark Amber and the jar should be marked 114 mm. This jar is filled entirely with dark Karo syrup. The 1985 Karo syrup was slightly darker than the 2011 syrup but appears the same on the Lovibond grader. Remember if you can't see through the jar because of its color, it must be dark amber.

Your six test jars should be checked for their accuracy of the mm. measurement against a Pfund color grader or a Lovibond Grader. Once they are found to be accurate they can be a valuable measuring tool.

To build a light box, I recommend that the show classes be reviewed. If the show has only three honey classes, a light box that contains the proper two test jars and room for a sample jar on each side would be sufficient. You should have abundant space for five jars.

Whereas the show that has seven classes of honey would need a light box that would hold 13 jars or two smaller light boxes for the portability factor. Use incandescent bulbs in the lighting because fluorescent light doesn't yield a natural color. The bulbs should be behind a translucent diffuser and have plenty of ventilation. The case should be painted white for light reflection. The wattage of the bulbs will be determined by the number of bulbs across the unit and the height of the cabinet. Several appliance type bulbs may be better than one or two 100 watt bulbs. You may consider a separate box to hold the test jars while transporting. BC

Jim Thompson gets out of the kitchen enough to be a Honey Judge, and Honey Judge Teacher.

KENYA CONNECTION

When Sharing Information, Each Side Gains

Jeremy **Barnes**

Joyce (a high school intern at ICIPE), Fiona Mumoki (an ICIPE lab technician) and Sara Ashcraft, our data collector. Evidence of the drought is visible in the sunflowers

Popular wisdom has it that the real work of a conference happens in the halls and around the coffee table. Add to that list the breakfast table.

Early in the morning of the second Saturday in November, 2010, I joined Maryann and Jim Frazier at the annual Pennsylvania State Beekeepers' meeting in Lewisberg as the conversation turned to their recent trip to Kenya. During her presentation at the EAS meeting in Boone, NC, Maryann had expressed the possibility of U.S. beekeeper associations forming a partnership with their Kenyan counterparts and my ears pricked up. I had been fortunate to live in southern Africa until 1991 although I had not been back since 1997 nor had I any real experience with Africanized bees aside from throwing myself flat on the ground in the middle of a cricket match as a brown swarm flew 4' overhead.

Maryann shared a copy of her EAS presentation and in February we arranged for a webinar at the monthly York County Beekeepers' Association meeting. The power point was projected onto a large screen as Maryann's commentary (she was phoning in from Florida) was broadcast throughout the room.

The decision of the meeting was one of interest although some members were preoccupied with the considerable losses in their own hives caused by a difficult Winter, and the agreement was that I would go to Kenya in June with Maryann's team and report back on the possibility of meaningful interaction with local beekeepers. As a show of good faith a number of members contributed hive tools, veils, smokers, gloves and dollars which were mailed to Nairobi ahead of the visit.

A meeting at State College in April revealed more about the trip. The sponsor is ultimately the Bill and Melinda Gates Foundation, working through the National Science Foundation and in particular the BREAD (Basic Research to Enable Agricultural Development) program which is designed to generate sustainable, science-based solutions to agricultural problems in developing countries.

Maryann Frazier and Dr. Elliud Muli plan for a day's work in the ICIPE apiary.

And there were three broad components to the project. In terms of the first one, *research*, *Varroa* is relatively new to Kenya (it is similar in appearance to the bee louse, which is prevalent in East Africa and local beekeepers did not initially distinguish between the two.) Could East African beekeepers be persuaded not to use chemicals, using South Africa as a model in which the decision to go chemical-free had ultimately resulted in bees that were tolerant of the mites? Heaven only knows the extent to which chemicals are mis-used by beekeepers in the U.S.; what are the risks of traditional and semi-literate beekeepers using such potent treatments, no matter how carefully it is done?

From the U.S. point of view, the number of mites infesting African colonies tends to be smaller then the those in European colonies, possibly because of the smaller average size of African colonies, their tendency to abscond and thus frequently start new colonies, or a hygenic trait which allows workers to detect mites behind capped cells and remove them. If there is a genetic basis for these behaviors, is there any relevance for the development of mite resistant European bees?

A top bar hive and traditional log hive in the ICIPE apiary.

Langstroth hives in a mangrove swamp on the coast.

In terms of the second component, *education*, whereas the biology of African and European bees is the same, management is different. The majority of Kenyan beekeepers are subsistence farmers who rely on sales of honey to supplement their meager income. Could an increase in both honey production and pollination quantifiably improve the quality of life in impoverished rural areas?

To this end Maryann and Dr. Elliud Muli of the South Eastern University College (SEUCO) and the International Center of Insect Physiology and Ecology (ICIPE) in Kenya facilitated a three day workshop in Nairobi with 16 attendees drawn from East Africa, each of whom has influence with beekeepers in their area.

The third component is one of *on-going support*. In an article on professional cycling in Rwanda printed in *The New Yorker*, Philip Gourevitch writes that "*Muzungus* tended to come, create excitement, make promises, and disappear."[1] What can we do to stay engaged? How can we assist and encourage Kenyan beekeepers in a way that is mutually beneficial?

We arrived in Nairobi in the second week of June, ie. the Kenyan 'Winter' with day time temperatures in the 80s dropping into the 40s at night. Kenya, which is similar to Alaska in size, is bi-sected by the equator and has distinct geographical areas rising from the wet coastal lowlands in the east to the highlands in the west (Nairobi is at the same altitude as Boulder, CO) which are dissected by the Rift Valley, as is the arid northern area. Evidence of the severe drought which has afflicted East Africa this year, more so in the north than the south, was painfully apparent.

The population is estimated at 38 million (the most populous state in the U.S. is California with about 37 million residents) of whom 75% are subsistence farmers. Recent data suggest that life expectancy is 48, the unemployment rate is 40% with consequent high crime rates, and that more than 50% of the population live below the poverty level.[2]

We spent our first week working in Nairobi, a large, sprawling city, at ICIPE and the second week at Mtwapa based at a beautiful beach front hotel north of Mombasa. ICIPE, a large, gated, very comfortable community has a research apiary attached whereas on the coast we visited a number of local apiaries, some of which contained hives specifically moved there from the highlands for research purposes.

One of the challenges was to approach Kenyan beekeeping with empathy cognizant of conditions of the ground rather than to impose our ideas, our methods, our preconceptions onto them. Four examples will suffice.

Many traditional farmers make charcoal (called *makaa* in kiSwahili[3]) as a cash crop to supplement their meager income, but this involves burning wood in a country that is blighted by deforestation.[4] Could honey and beeswax become an alternative source of cash, with the advantage of perceiving trees as a resource while increased pollination improves agricultural production and thus cash flow?

Beeswax is an unappreciated resource in Kenya. It is virtually chemical free and the extraction process of a log hive means that all of the comb is removed and, after the honey has been squeezed out of it, the wax is buried. When it was suggested that beeswax is a marketable commodity one of the beekeepers at the workshop immediately said that he could arrange for it's collection in

Stingless bees in Langstroth hives in Mama's apiary.

Muli translating in Mama Kasika's apiary. Let to right, Nixon (a driver and beekeeper), Fiona, the author, Maryann, Muli, Dr. Jim Tumlinson and Alice Kasika.

Eastern African sunrise.

his area, which was western Kenya. Beekeepers only had to know that it has value . . .

Secondly, the boost in elephant numbers over the past 20 years is heralded as a conservation success story but elephants frequently raid farms searching for food such as tomatoes, potatoes and corn prompting farmers to use poison, guns or even bows and arrows to protect their crops. In July of this year a report in the *African Journal of Ecology* reports that beehives suspended on wires between posts turned away elephants from crops in 97% of their attempted raids. (Bees cannot sting through elephant hide, but they can and do sting around their eyes and inside trunks.) And the income from honey production has given the farmers an incentive to maintain the fences.[5]

Thirdly, it is easy for *wazungu* to suggest not treating *Varroa* with chemicals and letting a more resistant bee emerge from the heavy losses that would result. But can one not realistically expect a traditional beekeeper, struggling to survive as it is, to stand back and let his colonies die, and with it his source of income, for indeterminate long term benefits?

A traditional beekeeper sells his honey by the roadside.

Finally, a traditional hive is literally a log about 5' in length with the center hollowed out and suspended in a tree.[6] Data gathered by ICIPE in 2007[7] suggests that 95% of Kenyan beekeepers work traditional log hives, 3% top bar hives, and 2% Langstroth. The average honey production of log hives is low (18 lbs per annum compared to 44 - 55 lbs for Langstroth) and it involves removing the bees and destroying the comb to extract that honey. Empty equipment is reoccupied quickly because of the high absconding and swarming behaviors and thus the destructive nature of the honey extraction is not seen as an obstacle. Moreover, according to Mama Kasika[8], a beekeeper can make three traditional hives per day at a cost of US$3 each, whereas a top bar hive and a Langstroth deep cost her US$55 and US$70 respectively.

Raina[9] suggests that the cost for a beginner to set up a small apiary in Kenya using four hives made of locally available material is US$218.

What quickly became apparent is that no serious study has been done of the advantages of log hives in east equatorial Africa. Are there reasons that the overwhelming majority of beekeepers stick with log hives, besides the obvious one of cost? Is there something about the African bee, about wax moths or *Varroa*, of which we are unaware? As Muli said very clearly, "You are not going to change Kenyan beekeeping."[10] We can only build on what is already there.

As the team developed and practiced in the ICIPE beeyard a protocol for collecting the necessary data I was introduced to two impressive beekeepers – James Kimani, aka Ngash, the head apiarist, and Joseph Kilonzo, aka Wamba, his assistant. It was quickly evident that these two men were adept at working African bees, were knowledgeable, observant and very competent. And clearly both were proteges of Muli, whom they addressed affectionately as "Doc."

We measured frames of brood, honey, pollen and adult bees, as well as hive weight, *Varroa* levels, growth rates of brood and average cell sizes. We tested for hygenic behavior using liquid nitrogen, *Varroa* infestation of drone v worker brood at the purple-eyed stage of pupae development, the reproductive success of *Varroa* by visually determining whether a foundress mite had offspring, grooming behavior using sticky boards, developmental rates for worker bees from egg to larva to pupa to hatching, and for levels of aggressiveness by putting alarm pheromone on a leather ball suspended in front of the hive for 30 seconds and then counting the number of stings.

The data was meticulously collected by Sara Ashcraft, a lab technician from PSU, and is presently being processed both at Penn State and ICIPE.

What can we offer? Whatever it is it needs to be a mutually benefi-

The Traveler's Hotel on the coast, our base for the second week.

Tsavo National Park is renown for its elephants. The males tend to be solitary while the herd is led by a matriarch, not unlike a bee colony.

cial arrangement, one that is neither paternalistic nor prescriptive. For example, the smokers used to calm bees before extracting leave a sooty residue in the hive which often finds its way into the honey. So good quality extractors are valued, as is foundation – those few beekeepers with Langstroth or Top Bar hives put a thin strip of foundation along the top of a frame (which are locally made and irregular) and the bees build on to and below it. So we could send foundation (which carries with it the risk of exporting contaminants and diseases) and smokers in return for wax, or we could help Kenyans devise and build smokers and foundation rollers that are effective, inexpensive, and comprised of local materials.

At a brainstorming session at EAS 2011 in Rhode Island in August, Wally Bloom offered to sponsor the purchase of a solar wax melter that will be shipped to Kenya as a prototype and which Muli will use to have some built locally. Beekeepers in the U.S. can then sponsor wax melters for groups in Kenya and receive as payment the first rendition of wax.

Although the biology of the European and African bee is the same, management needs are different based on disparate behavioral traits. For example, African bees are active year round, make a lot of honey and abscond readily. I for one now have a better idea of what kind of journal articles may be of value to Kenyan beekeepers and perhaps they could be copied and sent via ICIPE on a regular basis. Cell phones are omnipresent in Kenya - indeed the phone companies have pioneered methods of transferring money by cell phone, which makes sense when there is a significant urbanization movement and townsfolk need to send money home despite the lack of bank branches. So everyone texts and it's relatively inexpensive. Could we provide a resource by which we respond to text messages from Kenyan beekeepers who needed an outside opinion or a fresh pair of eyes on issues that are common on both sides of the Atlantic ocean?

When the news of my up-coming trip was announced a local beekeeper presented me with a copy of a beekeeping primer entitled *Bees Are Wealth* written by Dr. I. Mann and first published in 1953 with a second edition in 1976. What makes it unusual is that it is printed in alternating pages of English and KiSwahili. Could we up-date the content of the English pages, translate it into KiSwahili and distribute it to East African beekeepers?

It is common to find Kenyan beekeepers selling their honey alongside the road, packed in almost any available glass container with no label. And yet in the arrival hall of the hotel in Mombasa there was an impressive display of wines, mostly South African in origin. Why not local honey as well? Could traditional farmers be encouraged to package and market their honey to the British, German and Italian tourists who flock to the beautiful east coast beaches? They do not have the means to print labels, but we do. A grocery stall in a mall outside of Mombasa had eight shelves of honey, neatly packaged from central distributors in Nairobi selling at about $US3 per pound. How much better could the traditional beekeeper do with some direct marketing?

There is apparently a Kenyan Beekeepers' Association but it exists primarily on paper. I was peppered with questions as to how we in York County, PA organize and the services we provide to members. One of our drivers, after such a conversation, checked the York County Beekeepers' Association website over night and returned the next morning with more questions. One of the beekeepers in Maryann's workshop, a dignified man recently retired from some 38 years service in the Kenyan Army, including time as a peace keeper in Eritrea, had been chairman of his local water authority and immediately saw a way of transferring that knowledge and skill to local beekeepers, not least in collecting wax. How can we assist those who would like to organize?

And Maryann, ever brimful with ideas, came up with the concept of a "Beekeeper Safari," whatever that might involve.

Yes, we worked hard, and none worked harder than Maryann Frazier. Normally ready to leave for the beeyard by 8:00 in the morning, we would break for lunch and finish up in the late afternoon. But it was not all work. For example, on the drive to Mombasa, after a charming lunch hosted by Muli's mother at her family farm, we spent the night at Lion Hill Camp in Tsavo National Park and next morning had two game drives through the nature reserve which is renowned for it's elephants, although our sitings included lions, a hyena nursing cubs, giraffe, numerous

antelope, warthog, buffalo, a jackal and some magnificent birds. We got to see the Gede Ruins (the remains of a fifteenth century Muslim trading center which co-existed with Great Zimbabwe of the Mwenemutapa empire further south) and walked a trail over the mangrove swamps, returning in dug-out canoes singing Kenyan patriotic songs.

Nor were we confined to honey bees. First at the Kwetu Training Center for Sustainable Development and later at Mama Kasika's cooperative, we saw stingless bees kept in Langstroth deeps. Stingless bees store their honey in pots (the larger species has larger pots than the smaller strain) and although the amount of honey is limited (about 1½ quarts per year according to Alice Kasika) the value is twice that of regular honey (about US$6 per pound) because of its presumed medical qualities. When opening the hive the aroma of the smaller species was a little acrid, but the larger stingless bee hive emitted a sweet smell with a distinct mango influence.

The impressions of this country are many. School uniforms, the colorful dresses of the women, long unemployment lines, unruly traffic and overly busy roads, roadside stalls packed with fresh mangoes and paw paws, a lack of ATMs and limited use of credit cards, gated communities and security guards, fresh juices for breakfast, *Jambo* and *asante sana* and *karibu*,[11] Muli's laughter, being hassled by 'beach boys' on the sands of Mombasa, the startling trees and beautiful colors of the tropical flowers, lone elephant bulls, vervet monkeys bathed in the morning sun and lion spoor in the road outside of our camp, seemingly endless herds of goats, and of course *matatus* and *mkokotenis*.[12]

As an educator I was particularly interested in, and impressed by, the schooling system in Kenya. Muli explained that education is seen as the way out of poverty for Kenyans, that it is the largest segment of the national budget, that the first eight years of schooling are free and that teachers are viewed as the leaders of community opinion in the rural areas. Small schools exist everywhere so that no child has too far to walk but it also means that there are a large number of teachers required to fill the classrooms and the starting salary for a high school teacher is in the region of US$150 per month.

Three young lions on an old termite mound. The eldest was immediately suspicious when I leaned out of the vehicle to take his picture.

One evening I crossed the road from a rural apiary to look more closely at a four room school consisting of mud walls under thatch. The physical surrounds were spartan but the daily schedule ran from 8:15 to 4:30 five days a week and included subjects like English, [13] History, Current Affairs and Religion. And this was for five year olds! Also the level of conceptualization as expressed by words on the chalkboard was impressive particularly when contrasted with the bleak surroundings.

One event was particularly symbolic. Knowing that Sara's birthday fell on the first weekend of our visit, Muli, inspired by Maryann, phoned ahead to Lion's Camp in the Tsavo National Park and requested a surprise birthday cake. On the evening of Saturday June 7, after a long drive and a lovely dinner at the camp, and as the sun was setting, the chef emerged from the kitchen proudly carrying a decorated cake, followed by a Masai warrior who was the night security guard and by the kitchen staff who proceeded to circle the table singing "Happy Birthday." Sara cut pieces of the cake for each of us at the table, after which the chef cut further slices for everyone in the dining room and then for all the kitchen and serving staff.

Because in Africa it is customary to share. If one has food it would be unthinkable to eat alone. It was a moving example of *uBantu* in action: "I am because you are."

On the one hand I was overcome by the levels of poverty, not least in the urban slums; on the other hand I felt very energized in Kenya. I couldn't wait to get going in the morning, to open another hive, to talk with local Kenyans, to ask questions of our patient hosts. I wrote in my journal that it was like being a kid in a candy store; so much to see, so much to absorb. I know too that I learned far more than I might have offered, that I returned to the U.S. a much better beekeeper because of the experience.

No one person can solve the im-

James Kimani and Joseph Kilonzo. A hive was invariably worked by two people at a time, one to man the smoker.

The outside of a local school. Note the uniforms of the children in the background . . .

. . . and a first grade classroom.

mense problems that Kenya faces but hopefully we can do something to influence in some small way the lives of our fellow beekeepers in that amazing country. BC

My thanks to Maryann and Dr. Jim Frazier and Dr. Elliud Muli for their preview of this article.

1. Gourevitch, Philip; Letter from Rwanda. The New Yorker, July 11 and 18, 2011. Correctly the plural of muzungu is *Wazungu* and originally it meant someone who wanders without purpose or is constantly on the move. It has come to be applied to all white people in East Africa as most were encountered as traders, visiting colonial officials, or tourists.
2. **https://www.cia.gov/library/publications/the-world-factbook/geos/ke.html**
3. A common sight along the roadside is bags of *makaa* waiting to be picked up and taken to the nearest urban center. There seems to be absolute trust that those bags will not be stolen.
4. Wangari Maathai, founder of the Green Belt Movement, was awarded the 2004 Nobel Peace Prize in recognition of her work to restore trees to deforested landscapes in Kenya.
5. **http://www.bbc.co.uk/nature/14106484**
6. A traditional hive is no more than a hollowed out log and to extract honey the beekeeper has to remove the comb and crush it. We discussed the possibility of a simple queen excluder inserted half way down the log so that at least the queen and brood could be isolated, but the reduced space would probably encourage the bees to abscond even more frequently. These hives are often suspended by wire from tree branches so as to deny access to the honey badger, described as, pound for pound, the most fearsome animal in the world.
7. Raina, S.K. compiler; *A Practical Guide for Raising and Utilization of Silkmoths and Honey Bees in Africa*, 2007, IFAD.
8. Personal conversation
9. Op.cit.
10. Personal conversation.
11. Hello, thank you and you're welcome.
12. *Matatus* are 10 to 12 seater vans, in fact colorfully painted private taxis that can be hailed at any time, are invariably over-crowed and are notoriously reckless on the road. The name derives from *tatu*, or three in KiSwahili, which was the original fare in shillings. *Mkokotenis* are large hand carts that are pushed on or alongside the road, often filled with yellow jugs containing fresh water, bags of cement, building lumber ...
13. The level of instruction from Std 1 is English. Muli explained that his two children speak three languages besides English - the native languages of each of their parents and KiSwahili which is taught in school.

Kim **Flottum**

Soybeans & Honey Bees

Soybeans do make a honey crop. You just have to know where, and especially how.

Back in the day I was involved in soybean pollination research with the USDA, investigating the effects various environmental factors had on nectar production, and thus attractiveness to honey bees. Since soybeans are self fertile . . . that is, they don't need a pollen transfer agent such as wind, insects, birds or water, having honey bees visit them didn't seem important to bean farmers. But when they found out that if honey bees visit bean flowers yield increased, suddenly getting bees into bean fields seemed like a good idea. So whatever it was that made the nectar flow became important.

We studied a variety that was moderately attractive to honey bees that we had good field data on for visitation. Back at the lab we took that same variety and began tweaking soil fertility levels, air and root temperature, humidity, photo period, water stress and water excess. We looked at each factor by itself and in every combination you can imagine in a high-tech climate-controlled facility. Then we measured the number and color of flowers produced, when and if they opened, the yield in number and weight of beans, and eventually, the total dry weight of the plant. We also put test plants in a small chamber with a nuc and measured the number of bees visiting each blossom on each plant and how long they visited each blossom. We also collected nectar from each plant in a tiny, tiny pipette and measured the quantity and quality. The differences between treatments was in some cases essentially zero, and for some significant.

We found the ideal fertility rate, water regimen and soil and air temperature mix that let that particular soybean variety produce the most and best nectar, which induced the highest number of visits, and produced the most beans, due strictly to the additional pollination from honey bee visits. It was an exciting project to be involved in, and I've had an eye out for soybeans ever since.

So when Michael Meyer invited me down to see first-hand how one Missouri beekeeper makes soybean honey I jumped at the chance to get back to a productive soybean field again. True, we have beans here in Ohio, but I never found a beekeeper that made much if any honey on them, or even tried, for that matter. And, one of the key ingredients in soybean nectar production is the right combination of heat, humidity and soil moisture, and heat is often a lacking element in Ohio bean production. So Missouri, here I come.

Michael runs Honey Heaven, a one beekeeper operation based in Springfield, Missouri and has been keeping bees for nearly 40 years. He Winters near home in Springfield and makes a Spring crop in that area, but moves to soy country after the Spring flow. In this region soybeans are planted over a stretch of time. Early beans are planted right after farmers finish planting corn in mid-May when the soil is dry and warm, so the beans bloom about July first or so for 10-14 days. Later, after Winter wheat is harvested more are

Honey Heaven on the truck door is good advertising.

Beekeeping trucks have lots of loose stuff, and it all needs to be secured with rope. And rope needs to be tied. Knowing the knots that are fast to tie, easy to loosen and are safe to use is a sign of a good beekeeper. Do you know this knot?

Or this one?

A colony with new wax is inspected, and if ready, a frame is removed, after it has been checked for any brood.

The honey frame from below is moved up, and spaces at two and eight are made in the box below the excluder for empty frames so the queen has room to lay, and . . .

. . . an excluder is added. No brood in the honey supers is the name of this game.

planted right through the wheat stubble. These bloom about August 1 for the same length of time. These later beans bloom after corn is done tasseling, a good way to miss corn pesticides. Overall, about 90% of all the beans are planted between June 20th and July 10th. But of course plantings vary – by farmer, by year and by location so there's about seven or so weeks of bloom somewhere, lasting until about the 20th of September. By then night temperatures and photoperiod reduce bloom and nectar of nearly zero and it's time to call it a season.

The soil in that part of Missouri is a prairie loam with lots of sand and a mild pH. About 50% of the soy crop is irrigated. Missouri supports a great deal of conservation land, and most soy fields are close to some of these acres, which produce pollen during the down times between crops and later in the Fall. Soybean honey, if you've never seen it, is one of the mildest, least flavorful honeys I've found. As such, it's great for blending, and is sought after by packers to blend with darker, stronger honeys to bring the flavor profile around to what most grocery store customers expect honey to taste like.

The best beeyards are those that are surrounded by a range of planting date beans so within flying distance there's always something in bloom from July through September. Most years it works. Ideally, being surrounded by fields in different stages of bloom, different varieties, different soil types, little corn, some irrigated land and some not, and light pest problems is the goal – and most years that works too. It means staying in touch with as many of the farmers in the area as possible so there are no surprises. It's public relations, farm sense, good timing, and sometimes,

When frame swapping is done, both boxes have their frames spaced exactly with a spacer.

as Michael says, DBL . . . dumb, blind, luck.

Colonies are moved into beeyards just after a few nearby fields have begun to bloom, so some are already blooming but most are just starting or aren't even close. That's a good mix because when the bees arrive there's food available immediately, and more on the way for several weeks. Michael's bees are not palletized and colonies are moved using a boom. Not nearly as common as they used to be, boom loaders are without doubt a backsaver, but they still require work...you can only move one colony at a time, the truck must be relatively level, and you're moving from where the colony is to where you want it to be – even if you're not doing the heavy lifting.

The task Michael was completing when I arrived was adding honey supers to colonies he had delivered a short time ago. He had removed any honey supers from the early flow, and delivered his standard two brood boxes – a deep and a 7-5/8" super to the beans. This is, of course an inch deeper than the standard medium. He keeps each yard relatively small with only 10-14 colonies in each. This helps reduce robbing incidents because when the beans are done, or it's been too hot or cold or dry for them to produce, robbing can become intense. He pays 18 pounds of honey for yard rent, and makes as little impression on the field as possible. One track in and out, and no turnaround.

He's careful how he adds honey supers. And not unlike John Piechowski, that Wisconsin beekeeper we visited a while back, to watch an experienced, careful beekeeper work is poetry . . . smooth, slow, easy, unhurried, but without a wasted motion . . . is always a pleasure. I'm not there yet, that's for sure.

Each colony is examined the same way. The migratory cover is carefully lifted and the top bars and top of the comb that bulges out past the top bar is examined without moving a frame. If there's a honey flow on, and room is running short the bees will have added white wax to the cells on that comb shoulder and if really short of room will have put new wax, even comb on the top of the top bars. When you see that, you know it's time to add more space for honey storage.

Now Michael uses queen excluders on every colony because he doesn't want even one cell of brood in his honey supers. But, and this is

A flat trailer full of honey supers is moved to one of the farms Michael has bees on at the beginning of soy season. Supers are covered with a tarp and stay safe and clean until needed.

A trick Michael uses is to attach this piece of L-shaped metal to the bottom board, a bee space in front of the entrance. This reduces robbing, mice, and weather problems.

Because colonies sit directly on the ground, after a few weeks weeds begin to be a problem.

To fix this, the colony is simply pulled backward a few inches, leaving a clear, open path with only dead grass in front.

where knowing how to use a queen excluder really helps, you sometimes have to give the colony a reason to go up into that new super. Michael takes two frames with honey, and absolutely no brood from the top 7-5/8ths brood box, and puts them in the new 7-5/8ths super to be added, and puts empty frames in the super below (now you see why the top brood box and honey supers are the same size). If there is any brood at all on a frame it is not moved because it's on those frames the queen might be sitting. She must remain below. The empty frames from the new super are put in position two and eight in his nine-frame super brood box below the excluder. This gives room for the queen to keep laying and at the same time tells the bees that yes, it's OK to put honey up stairs because there's some already there. When finished swapping frames, both the brood box below and honey super above get their nine frames spaced exactly using a spacer. Like all good keepers Michael leaves nothing to chance.

If there is not white wax on the comb or topbars then he waits a week and checks again. Add too soon and you can get honey chimneyed up the center. Plus, though not prevalent, small hive beetles can be an issue in a colony without enough bees to protect all the comb.

Speaking of beetles, Michael's main defense is maintaining strong colonies of course, and the fastest hive tool in Missouri. When a cover is first removed, the beetles are momentarily still, and Michael seems to get five or 10 with his hive tool before they scamper away. Some colonies, of course, have none or only one or two, while some have several. Strong colonies . . . that's the answer.

There are other plants blooming during soybean bloom – an exotic milkweed we found growing in a hayfield was only a foot tall, but was covered with Monarch Butterfly larvae, a pleasant surprise, and a native thistle was somewhat common on roadsides and in unused fields. Two varieties of knapweed are native here also, one blooms early in the season while the second waits to about mid-Summer to start up.

This is what the tops of the frames should look like when the honey flow is just starting, fresh wax on the shoulders of the comb and a little new wax on top of the top bars. If there's more, especially on the top bars, you waited too long and missed some of the crop.

A good bee truck comes equipped with a bar on the side of the bed for tie-downs, and lots of equipment boxes underneath, not taking up important carry room on top. Boxes haul rope, smoker fuel, extra protective equipment, fire extinguishers, tools for engine repair and in this case boom repair, and anything a beekeeper will need when on the road.

It was excruciatingly hot the two days I tagged along. Good for the honey flow, but hard on beekeepers. However, it did make working the bees easier. It would be over 80 just after dawn when we started for the day, and by noon it was too hot to measure. However, the bees were working something somewhere, and for all the time I was out there, I didn't use or need a smoker or veil (primarily because my veil was attached to a jacket, and the jacket was way, way too hot). Michael always had his on though, but it was just a hat and tie on veil. That's something I would have never thought possible, but the bees were so busy and so calm it was almost like checking empty equipment. These bees were a joy to work, but the weather just wore you out.

At noon we broke for lunch and actually went into town for a bite and an air conditioned break. One thing about being a solo beekeeper is that when you are 15 miles from anywhere you better have everything you need to survive excessive heat, flooding storms, a broken truck, medical emergencies, food and water, a bee disaster...everything. Plus, it's always good advice to have someone know about where you are so when you don't return they know where to start looking. You can see from the photos that, like every good bee truck, this one was loaded with boxes holding equipment that can deal with almost any problem encountered while in the field.

When you live a long distance from where your bees are, having a local storage facility is a good idea. Michael has an arrangement with one of his farmers to keep a flat trailer full of supers and an old truck trailer full of other equipment handy, so when he forgets something he

The boom is mounted on the back of the truck. The long arm turns 360 degrees, and the pulley lift on arm slides the entire length of the arm. Moving the cradle up and down is mechanically driven, moving the slide is done by the beekeeper.

The operator holds the cradle with both hands, and operates the up and down buttons with a right hand thumb.

The cradle is positioned vertically and in front of a stack of supers . . .

. . . and slid in. Each super has a cleat that the fingers of the cradle fit under. When the cradle is snug against the front of the stack the up button is pushed and the stack is lifted.

doesn't have drive 100 miles to get it - only five or so. Or maybe just bring it tomorrow. The flat trailer comes early with empty supers, stays until the bloom is over, then returns home with supers full of honey. The truck trailer lives in the area year round, and is a good idea if you have a fair amount of equipment and have to travel long distances to get to remote hives. The Piechowski's in Wisconsin had small, breakdown buildings in their beeyards, and a trailer does the same thing. It can save you a lot of windshield time and gas. Michael keeps shells (supers without frames), excluders and other moth neutral equipment in the trailer.

Honey from this crop is a bit strange. I mentioned it's flavor and color, but the early crop gets capped, just like it should. But later crops seem to not get capped nearly as much. With low, low humidity and high temperatures, the bees don't seem to see the need for it, and the moisture content never is high enough to worry about fermenting later. It's weird, but it works.

With all his crops, Honey Heaven makes about 20,000 pounds of honey a year, more or less, and up to this season all of it has been sold retail at top dollar. But recent changes occurring in his market point to wholesaling becoming a bigger part of the business. Because he's a small operation, and there's not a lot of pollination potential in the area (other than the free services he offers to his farmers), continuing strictly as a honey operation seems a good choice. Even with some of the crop sold wholesale, the price of honey remains attractive.

But the opportunity of sending some of his colonies to California for almonds hasn't gone unnoticed and the timing wouldn't interfere much with his honey crop. But high honey prices, even with the variability of Missouri weather, make moving a tough call.

But Michael isn't a spring chicken anymore, and jumping off the back of trucks and lifting two honey supers at a time...all tricks for a younger beekeeper anymore. And he does enjoy playing the fiddle and heading downhill on skis. Time will tell what the future holds for this soybean honey maker. BC

Once off the trailer bed, the beekeeper can keep lifting, or spin the stack left or right, or push it forward or backward. It's as easy as it looks, after you've had several years experience. I managed to move the first stack without difficulty. The second landed on the ground.

Once off the trailer, the stack is swung over to the truck and gently set down, exactly where it should be.

Hawaii Reality Check

Larry **Connor**

Thoughts After A Hawaii Master Class

In February I visited the Big Island of Hawaii to get a first-hand view of the triple storm of varroa mites, small hive beetles and *Nosema ceranae*. In September I was invited to return to the Island for the Western Apicultural Society meeting, and following that the meeting planners set up a Master Class for me to teach for the area beekeepers as well as WAS participants.

The meeting was held in Hawi, on the far northern part of the western side of the Big Island. It is an area just above a very dry zone. The area is near the end of the road, literally, since there is a break in the highway because of the large mountains and a protected valley. Beekeepers Stbon Tarnas and Ron Hansen brought in colonies for the class to inspect and to make increase hives. Big Island Beekeeper President Carry Dizon put this all together at a Palili Cho Han kyu Natural Farming Learning Farm where folks are being trained on the fine art of taro farming, a native food.

Hawi is a small town built in the days of the sugar plantations, but now serving local residents but mainly the tourists who venture this far north. It lacks what some consider the conveniences of the large cities – no big box stores and fast food places. You have no choice but to go into local restaurants where the people were extremely friendly and the staff is eager to please. I spent a few extra days in the area after the class was complete. There was a great coffee shop for breakfast, a well-regarded restaurant called Bamboo, (recommended to me by WAS past president Dewey Caron), and a restaurant/bar called Lukes which is part of the hotel. The best music was Sunday night of the three nights of local groups.

Back to bees. For the majority of the mainlanders (a diverse group from Washington State to outside Washington DC, British Columbia, and a very welcomed but lost soul from northern Minnesota) participating in the course it was the first time they had seen the colony conditions in Hawaii, especially with small hive beetles. They learned that beetles are able to refill an oil tray in just a few hours after we worked a colony (something Hanson says it typical). For the Island beekeepers, it was a rare opportunity to talk to beekeepers who had been through at least some of the problems they face, especially with *Varroa* mites. The Island beekeepers consisted of folks like Ron and Stbon, who have had larger numbers of colonies, to a number of folks who own one hive, or at least an empty one without bees.

Ron is on his way to figuring out much of the management against the pests, and has about doubled his hive count since February. He pays a lot of attention to colony strength, *Varroa* control, frame spacing, and has used several control methods for *Varroa*. Since my February class he has raised some queens as well as secured mite resistant queens from the big queen producers on Island.

For most of the world Hawaii is known for its queen production. There are several large operations near Captain Cook that produce early season queens in tremendous numbers for sale to the United States, Canada and the rest of the world. Ironically, they do not routinely provide small queen customers from the Island with queens during their peak season. This creates a huge demand for queens and no one on Island able to meet that demand.

After everyone had checked in with the group about themselves and their beekeeping activities, we moved to the apiary to inspect two colonies. I will admit I wanted to see do a lot more (I am always over-prepared), but with the number of people in attendance and the huge range of questions we were trying to answer, we did not move as fast as I would really like. But hey, that is the joy of teaching such a diverse group in strange surroundings using someone else's bees.

Danielle Downey, Hawaiian State Apiarist and her new assistant Lauren Rusert (formerly located at Penn State University) were able to participate in the program – I suspect it was an excellent opportunity to find out what is on the minds of the many beekeepers.

Making an increase hive with two frames of brood. Here is the first. There was a lot of discussion on the best way to make new colonies.

Ron's queen, a few drones and worker bees.

Ron removes every trace of burr comb from each colony to prevent the beetles from laying eggs in areas where bees cannot reach. He carefully eliminates this comb from the apiary.

We worked the colony in the morning session, and Ron changed the cooking oil in the trap. By 2:00 that same afternoon there were hundreds of young beetles (brighter brown) in the oil.

Some thoughts

Islanders have unfortunately learned how completely devastating the small hive beetles can be, and after the Master Class the Off-Islanders know too. For an oil trap (fitted by Ron to his own design of a screened bottom board) to have dozens if not hundreds of apparently newly emerged beetles just a few hours after inspecting the hive clearly indicates both the speed of the beetle reproduction, as well as the unique dangers of beetles entering the hives when manipulated by beekeepers. At the WAS conference there was data presented indicating that beekeeper interruption does not change the infestation rate, but there is some pretty clear evidence that either this is not be the case all the time, or there is a constant pressure on the hives on the Island that poses a horrific threat to any unprotected colony.

Clearly the oil traps are needed at this point in the small hive beetle epidemic. I don't see how any colony could survive without them without using chemical treatments inside the hive. Or use a combination of beetle traps, beetle barns and other defenses that will hold the beetles at bay. The oil trap works because it constantly captures new beetles soon after they enter the hive and are (apparently) directed there by the worker bees and their internal hive defense. Having a trap full of adult beetles – old or newly emerged – is a good thing. Having an oil trap filled with beetle larvae indicates that the hive has active beetle reproduction, and will most likely be slimmed out by beetles. The bees are repelled by this, are reluctant to reuse the equipment and die from who knows what other factors.

Diatomaceous earth in oil trap is used by Stbon as control for varroa and small hive beetle larvae and adults.

There is a clear path for beekeepers to develop tolerance to small hive beetles. USDA researchers report that Russian bees are more likely to attack and expel beetles. We know from printed accounts that nearly 200 years ago the Eastern United States experienced a severe attack from wax moths, leaving clover fields quiet and honey barrels empty. Since our honey bees apparently developed (survived) the worst of the wax moth attack, by developing tolerance behaviors against the moths, it seems that this should also happen with small hive beetles. Ultimately beetles and wax moths will be treated much the same – as a seasonal phenomenon in northern states and as a chronic issue where warm weather, stored food reserves, and weakened colony dynamics are experienced.

When we discussed this some beekeepers felt that colonies must be mean (defensive) to ward off beetles. So far I have not seen much success with this method, and I think there is a very good reason: the behaviors for colony defense outside the hive use one set of genes for defensive behavior, while the protection inside the hive are more tightly associated with grooming, housekeeping and nest homeostasis.

There is also confusion between the development of bees that are resistant to brood diseases (like the Minnesota hygienic strain and others) that use diseased/infested cell uncapping and cell removal behavior as compared to those colonies with good housekeeping skills – low numbers of dead bees in the hive, a clean bottom board, and a general neat and tidy appearance. There is a lot of confusion by all beekeepers about how bees carry our their business, and I have to admit to how much I don't know about these things after forty plus years of trying to figure it out.

We discussed the selection of small hive beetle resistance at the Master Class, making the point that we are years away from such resistance. Yet the students all seemed to understand the role of selection of good colonies from survivor stocks so that they may speed the achievement of small hive beetle resistance. Treatment with chemicals (rather than the oil traps or other traps) will select for resistance of the beetles to the chemicals but potentially eliminate

Hawaii Apiary Specialist Danielle Downey searching for the queen between sheets of natural comb. The Off Islanders wanted to fix this comb into an empty frame, but the Islanders said that the beetles would have too many places to lay eggs, so the comb was cut out and the honey saved.

Christmas Berry honey collected in less than a week in Hawi, HI .

or thwart development any resistance the beekeepers are developing to the beetles. It is a bit of a circular trap.

I tried to show how the colony is put together in a typical hive, with the honey stored on the outside of the nest, with pollen surrounding the brood and the brood in the center of the box. But we found that under the warm Hawaiian conditions there can be separations between brood frames with pollen and even honey filling the combs. The colonies in Hawi were on a strong nectar flow from the Christmas Berry (*Schinus terebinthifolius*) which is the same plant as the Brazilian Pepper my bees visited when I lived in South Florida. The nectar and honey I tasted was different from Florida, but is this a climate-soil effect? Even with a box of foundation on the hive, and the bees filling the frames, the bees were filling the brood combs with honey-nectar as the adult bees emerged from the comb. Since these bees are not preparing for a Northern Winter, are they using the trigger of a shortening day length to store nectar in the brood nest? Or are they so tight for space, is the nectar flow so intense, that they have no other place for storage? In the next few weeks the colonies will expand their brood and prepare for the next nectar flow.

There were few drones in the air the afternoon of the class, and few drones on the combs of the hives we worked. They did not have much semen when checked. Yet there did not seem to be a nutritional aspect of poor drone rearing conditions. Perhaps this influenced the recent replacement of the queen. But all beekeepers should watch drone levels as both an indication of reproductive strength as well as a method of *Varroa* mite control. This has not been developed to a great extent on Hawaii.

There was good evidence that the colony we worked had recently produce a new queen, and she was in a rapid expansion mode for the colony. Frequent queen replacement is not a new thing in the tropics, for the queens are often laying eggs without a seasonal break. The break in the brood cycle undoubtedly helps minimize the *Varroa* mite levels, and may be one management method Island beekeepers can use to naturally suppress mite reproduction. Queen replacement creates an environment where small hive beetles are attracted. I have seen this in Michigan – remove a queen, and the beetles move in – return the queen and the beetles move out. We need to know a lot more about the interaction between beetles and queens.

Finally, the purpose of the course was to discuss making increase hives, and nowhere it there more discussion about the best way to make an increase hive from a strong colony. Questions and concerns include: Is the colony strong enough to split? How strong should I make the increase hive? Should I leave the hive in the yard or move it two miles away? How many bees do I need to shake into the hive? Should I let the bees raise their own queen or add a queen cell, virgin or mated queen? (This topic took us a long time to discuss). Island beekeepers have traditionally used Increase colony-raised queens as their default mode because of the difficulty in obtaining queens. With the warm climate, the availability of nectar from many sources, it makes sense. Making new queens from the colonies that are alive will maintain any genetic components that enhance survival. But the addition of resistant genes from the mainland via the big queen producers will let the beekeepers jump-start their resistance efforts.

Danielle Downey and Lauren Rusert will be working with Island beekeepers to develop queen rearing courses and may eventually offer instrumental insemination services for local beekeepers. It will require several beekeepers to step up and take on the responsibility of producing and providing queens with desirable resistance characteristics for the local beekeeper market. There were several Island beekeepers who were very interested in this concept, and I hope that they will be successful at this effort.

Thanks to Irene Grunfeld at the Lava Tree Tropic Inn for letting me use the breakfast table on the veranda to write this article. Check out **www.lavatreetropicinn.com** if you are ever in need of a place to stay in Pohoa, Hawaii. The bees on the property belong to Ron Hanson. It is a small world. BC

Thanks to Bonnie Swanson for photos.

I look forward to seeing my New England friends at the annual Southern New England Beekeepers Assembly (informationat **www.wicwas.com**). In January join us for the annual two day Serious Sideliner Symposium at the ABF meeting in Las Vegas. Check my website for a new book *Bee Equipment Essentials.*

To Be Or Not To Be . . . A Bee

The Legs

Roger **Hoopingarner**

In a previous article I covered the wings and flying and their part in locomotion. Locomotion is the major function of the thorax, and why these segments are almost entirely filled with muscles. Now I want to cover the legs of the honey bee, certainly a part of locomotion yet in the honey bee the legs are used for so much more.

As a typical insect, the bees have three pairs of legs, one pair for each thoracic segment. Each leg of an insect consists of five segments, some of which have multiple parts. Starting at the body these segments are the coxa, trochanter, femur, tibia and tarsus.

The hind leg (meta-thoracic) is the one that most beekeepers are at least somewhat familiar with as this is the leg that carries the pollen. It is the tibia and the basal segment of the tarsus that are highly modified in the worker bee to form the pollen collecting apparatus. The pollen basket and pollen comb are shown in Figure 1. (Neither the queen or the drone have this modification, which is interesting since its presence is so important in the success of the colony, and yet the reproductive members do not show this feature.)

The pollen basket is on the outside of the tibia, which consists of a whorl of setae, or spines, that hold the pollen for the trip back to the hive. On the inside of the large and flattened basal tarsus are a series of rows of spines that form a comb. This comb is used to scrape the pollen from the body hairs (setae) that the bee has "collected" while visiting the flower. In an earlier article I said that one of the distinguishing features that make a bee different from other insects is that the hairs (setae) on the body were branched and this allowed many pollen grains to become imbedded in them. When the bee combs its body and collects the pollen on the comb they then rub their hind legs together and in so doing the pollen is pushed upwards through a curved part of the basal tarsus into the pollen basket on the outside of the tibia. This curved part of the basal tarsus is often called the "pollen press", or auricle. This transfer of pollen grains from the comb on

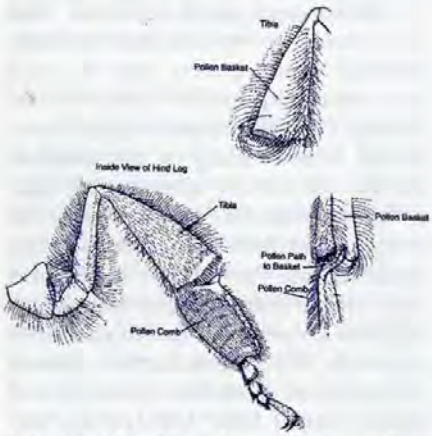

Figure 1. *Hind leg of a worker honey bee. The tibia and the basal tarsus are modified into the pollen collecting apparatus.*

the basal tarsus to the pollen basket takes place while the bee flies from flower to flower. (This transfer of pollen while going from flower-to-flower was brought home to me when I was observing bees collecting pollen from a dish of pollen that I had provided in a greenhouse experiment that I was conducting while on sabbatical at the USDA Carl Hayden Bee Research Lab many years ago. I was testing different pollens for attractiveness [odor?], and the bees would land on the pollen and almost immediately jump into the air. At first I thought that the pollen might be repellant, but upon closer examination the bees needed to be airborne in order to be able to rub their two legs together [pollen combs]. Once they had moved the pollen to the baskets they would drop down onto the dish to collect more pollen.)

The size of the pollen pellet varies with the source of the pollen itself. Some pollens are abundant and light and thus the pollen ball will be quite large, while others are smaller, less abundant and more dense and thus the pellet is smaller. The total weight

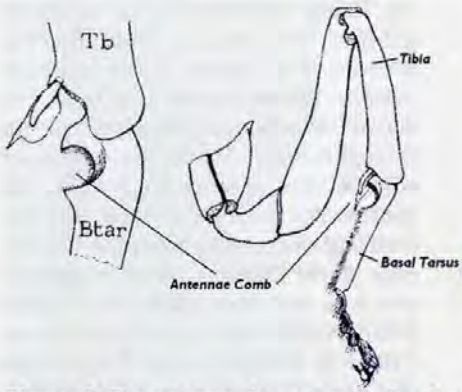

Figure 2. *The antenna cleaner on the fore leg of the worker bee. Used to clean pollen and other debris from the antenna.*

of the pollen mass is generally in the order of 20-40 mgs.

Once the forager returns to the colony with a load of pollen it finds an open cell or one that has some pollen within it and deposits the pollen. The forager straddles the cell and uses the middle pair of legs to dislodge the pollen pellets from the pollen baskets and the pellet falls into the cell. The forager, or more likely a house bee, uses its head to tamp the pollen into the cell and thus compact it.

Honey bees also have an interesting adaptation on their forelegs that is used to clean their antennae. This antenna cleaner is shown in Figure 2. It is a semi-circular groove formed in the basal tarsus. The circle is made complete by a hinged flap that comes closed once the antenna is placed into the groove. The bee then cleans the antennae by pulling it through the

circular hole which has the comb-like setae that encircle the cleaner. You can often see a bee cleaning their antennae when they are about to leave the hive, or whenever the antennae may have been covered with pollen or other material. By cleaning the antennae the bee would clear the sensory pores on the antennae of excess pollen or other substances allowing the pores to detect the odors necessary to find flowers and other navigation signals. These antennae cleaners are a very essential tool in the life of the bee, both within and without the hive.

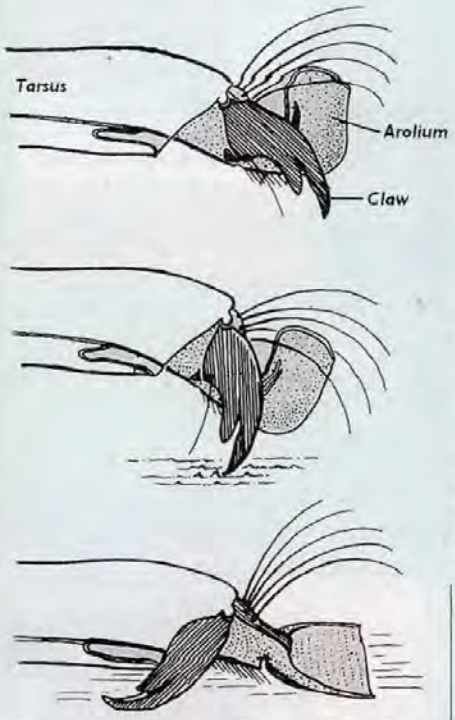

Figure 3. *Tarsus of the worker bee. In the top view the arolium is held up and the claw is extended. In the middle view the claw is used to contact a rough surface. In the bottom view the arolium is pushed down to contact the surface.*

The end region of each leg is the tarsus. It is a five-segmented part that ends in a pair of claws and a pad. The tarsus of a worker bee is shown in Figure 3. The important parts are the claw and the arolium, or pad. The claws are used on any surface that allows the claw to dig into it. On any surface where the claws are not able to dig in the arolium it used. For example, on the glass surface of an observation hive the arolium of the tarsus would function. The arolium has a sticky surface that allows the bee to walk up the surface of the glass. In Figure 3 the top diagram shows the claw extended and the middle diagram shows the claw digging into the surface. The lower diagram shows the arolium pushed onto a surface, and the claw moved out of the way.

There is an additional function of the tarsus and arolium in the queen bee as this is the structure most likely used to distribute the "foot-print" pheromone on the surface of the comb. The foot-print pheromone helps retard the development of queen cells on the comb. In a colony that becomes too large the queen cannot sufficiently cover the comb surfaces, and distribute the foot-print pheromone, and thus swarm cells are more readily developed.

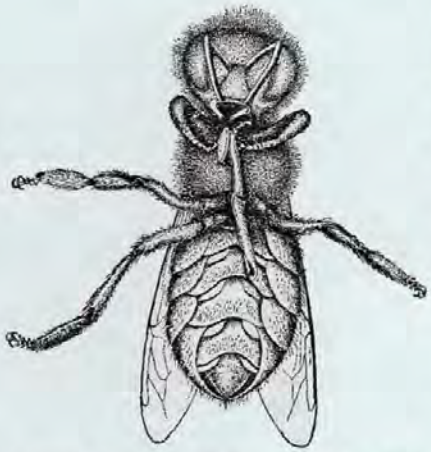

Figure 4. *Original drawing from D.B. Casteel. (USDA Circ. 161, 1912). View from under a bee as it moves a wax scale from the abdomen to the mandibles.*

There is still one more function of the legs beside walking and that is the manipulation of wax scales. The wax scales (four pair) are secreted from glands on the ventral side of the abdomen. (I will cover the glands in more detail in a subsequent article.) When a bee needs to mold a portion of a new cell, or to repair an old one, the bee scrapes the wax scale free from the abdomen by hooking it on the pollen combs of the hind leg and then moves it forward to the mandibles where the wax can be softened and put into place. This process is shown in Figure 4 from the underside. The bee balances on three of her legs while she moves the wax scale to the mandibles.

Thus, we see that the legs of a honey bee are indeed highly modified and quite unique among the insect world. The legs not only are used for walking but also for antennae cleaning, pollen gathering, wax manipulation, and at least in the queen bee are used to distribute pheromone. BC

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In The Northeast

THE 2011 HONEY HARVEST

Ross **Conrad**

These are times that test a person's resolve to keep bees –

Too much rain. Not enough rain. The sub lethal effect of pesticides, herbicides and fungicides. You name it, it is being blamed for one of the worst honey seasons many beekeepers can remember experiencing in a long time around here.

There were some very localized areas where the bees made a decent honey crop (about average) in New York, New Jersey, Pennsylvania, and the New England states. Interestingly enough, many of the locations that did alright happen to be in or near urban centers. For most of the rest of the beekeepers in the Northeast the 2011 honey crop seems to be turning out to be a bust. As this article is being written, mid-September, beekeepers are hoping for a strong goldenrod, knotweed, and aster flow to give their hives a much needed boost going into Winter. If the Fall flow does not materialize, there will be a lot of feeding going on as beekeepers scramble to prevent starvation over the Winter.

For some if they did not feed early, it is already too late. Many beekeepers report hives that "went backwards" during the season. That is, they started using up their Winter honey stores to maintain and grow their brood nest in mid-to-late Summer since fresh nectar became unavailable for long stretches at a time. Some hives were literally on the brink of starvation in late August and early September having used up all their honey raising bees. These hives didn't have enough honey to survive another month, let alone make it through the Winter. Of course once the honey ran out these colonies cut back or even eliminated brood rearing altogether and became ornery. . . starving bees are not happy bees.

Why might it be too late to save a hive that ran out of honey and stopped raising brood if there are still bees in the hive and they can be fed in late Summer and early Autumn? In a word: protein. Once the bees stop raising brood they also stop foraging for and storing away significant quantities of pollen. It is an excess of pollen that allows a hive to store enough protein to allow them to raise brood in mid-late Winter as they begin their all-important build-up of population in anticipation of Spring. Thus, for folks who only fed sugar syrup and no protein to hives on the brink of starvation, this Winter may end up being a tough one.

This is the kind of situation where the additional work and stress of migratory beekeeping may pay off big for both the beekeeper and the bees despite these days of CCD. Migratory outfits typically only need 20-30 pounds of honey in their hives at the end of the season here in the Northeast for the trip down south to places like Florida where, provided that the weather cooperates, the bees should have a chance to fatten up on Autumn honey flows. While the migratory guys (and gals) may not be harvesting much of a honey crop, at least they shouldn't lose their bees to starvation as well!

Most folks are pointing at the wild weather fluctuations during 2011 as the reason for the poor honey harvest. Spring was cool and wet. Much wetter than normal for many areas with Spring flooding to boot. Hives that didn't get swept away by rising water were unable to fly much due to the heavy and incessant rains. As a result, little honey was gathered. I have also heard the theory that when there is a lot of cloud cover early in Spring, plants starting from seed are not able to develop their root systems effectively. As a result, the nectar that the plants produce later in the season has a lower sugar concentration than normal which impacts the bees.

Then the pendulum swung the other way and everything tended to dry up. Temperatures soared and drought gripped many areas of the Northeast during July and August. While the drought experienced in the Northeast was not as severe as droughts suffered in places like Texas, it impacted the bees' ability to forage for nectar

just the same. When the rains returned, they returned with a vengeance and a name: Irene. More flooding. Much more flooding in places like Vermont and Massachusetts. Is this the sign of things to come as we reap the harvest of unpredictable weather patterns after burning too much fossil fuel for too long? That is just a rhetorical question by the way, as regular readers already know that I (along with the majority of scientists who study this stuff) believe that the frequency and severity of extreme weather patterns is indeed a result of our collectively increasing the levels of carbon dioxide in the atmosphere 25 percent more that what would be considered normal for this period of Earth's history.

For those in the business of beekeeping, this season's experience emphasizes the importance of running a diversified operation. If you depend solely on honey production to produce a cash flow, you are likely to go out of business especially if we have a repeat of this year's honey season in 2012. For some, selling bees or picking up some pollination contracts might be the deciding factor as to whether they live to bee keep another day.

One interesting observation of the 2011 season is the increase in late-season swarms or supersedures. While late August and September swarms are not unheard of, a number of beekeepers have reported seeing more ready to hatch, or recently-hatched queen cells in hives late in the season than is typical. Whether these are swarm cells or supersedure cells is not completely clear. Since I have not heard reports that swarming has gone up late in the season, my guess is that the bees are simply replacing their queens. But why?

Beekeepers are often quick to blame the queen when a hive performs poorly with regard to honey gathering. Could the bees be doing this too? A less anthropomorphic theory for the apparent increase in late season queen rearing has to do with the ability of fungicides to create problems with the pheromones of queen bees. Given the record-breaking rains and flooding that has occurred this year, farmers are using fungicides on their soggy fields in greater amounts than usual. Just as hives that run out of honey stop raising brood and thus stop collecting pollen, the break in the brood cycle caused by the process of replacing a queen can negatively impact pollen foraging and may expose hives to increased nutritional stress which can translate into poor wintering.

All things being equal, the winter following a poor honey season is a tough one for the bees. When a colony does not eat well during the season, they are not well-fed, not well provisioned, and the hive's health is not as good as it should be. With luck this Winter will be mild and short . . . the bees (and beekeepers) could use a break.

Ever the optimist there is some good news that I'd like to focus on amongst all the difficulties beekeepers have experienced this year. There is a lot less work to do lifting heavy supers since the honey crop is so small to non-existent, in many areas. And between the poor honey harvest and inflationary pressures, honey prices are liable to go up, especially for local honey. This means that beekeepers who are sitting on a surplus of honey from last year will see a windfall. Okay, so these aren't necessarily the greatest pieces of news, but hey, we've got to do everything we can to keep our motivation up and not throw in the towel before the new year rolls around. After all, next year has got to be better . . . it certainly can't be much worse. BC

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Citrus As Nectar & Pollen Plants

Connie **Krochmal**

Calamondin (Citrus mitis)

Citrus is among the best nectar and pollen plants for warm regions. This is grown mostly in Hawaii, the Southwest, West, California, along the Gulf Coast from Texas to Florida, and the Southeast.

The original wild citrus was from India and Southeast Asia. These evergreen, aromatic trees or shrubs range from two to 20 feet or more in height. Spines often arise from the leaf axils. The thick, leathery leaves vary in size, depending on the species. The beautiful, scented, starry blooms are either white or pink. The blossoms appear singly from the axils and in terminal clusters. These often have five petals.

While some citrus needs cross-pollination, others don't. These fruits are berries. The trees typically have flowers and fruits at the same time with harvest occurring any time of the year. Fruit characteristics, such as size, color, shape, and juiciness, are affected by climate. Seedless citrus contains five seeds or less.

Nectar and Pollen from Citrus

These plants yield pollen and nectar. Under favorable conditions, they produce more nectar per acre than any other major nectar plant. February to May is typically the peak bloom. Factors affecting nectar flow include weather and moisture.

Grapefruit (Citrus paradisii).

The honey yield can vary from year to year with the taste and color differing widely. Often very light colored, it can be amber. Stronger flavored ones are often mixed with milder tasting citrus honey.

Growing Conditions and Care

These are mostly suited to zones eight through 10. Needing long, hot summers, most do best in dry climates.

Provide the trees with shelter from strong winds. Generally grown at low elevations, these prefer a light, fertile, well drained soil. Full sun is best except in the desert where some light shade is beneficial.

Although the fruits are sensitive to frost, the trees can tolerate three to four degrees below that. In general, citrus is damaged by temperatures below 25°F. The cold tolerance varies from one kind to another. Tangerines are fairly cold tolerant. Kumquats are most hardy of all – from 17 to 20°F.

These need watering during long, dry spells. Generally, they're fairly easy to grow. Citrus requires less pruning than most fruit trees. Fertilizer is usually applied several times a year, depending on the climate.

Calamondin (*Citrus mitis*)

The calamondin is a hybrid of the kumquat and mandarin. This is native to the Philippines. Almost spineless, this medium to large tree is good for marginal areas. It can tolerate slightly colder temperatures than most citrus. The oblong foliage emerges on winged stalks. This blooms when very young. The flowers are less than an inch in length. Bearing year-round, the trees bring huge crops of extremely small, flattened fruits, less than ½ inch in diameter. The peel is edible.

Grapefruit (*Citrus paradisii*)

Among the largest and most popular of the citrus fruits, this is native to East Asia and Polynesia. It is hardy to zone nine. This could be a natural hybrid of the sweet orange and pommelo. Known in Barbados since 1750, it was introduced to Florida in 1823 by Count Odette Philippe, surgeon of Napoleon's army. The first commercial Florida orchards began in the 1880s.

Kumquat (Fortunella spp.).

Withstanding light frost, the bushy, spiny trees are taller than orange and pommelo trees, about 20 to 30 feet. The oval foliage is quite large and thick. Appearing in clusters, the fruits are four to eight inches across. These ripen to yellow. A number of varieties have red or pink flesh.

Grapefruit is a good source of honey, yielding somewhat less nectar than oranges and lemons. The honey can range from water white to any shade of amber. Becoming darker as it ages, the shade varies from year to year. Granulation takes several months. Quite aromatic, it smells like orange blossom honey. The tree also provides pollen.

Kumquat (*Fortunella spp.*)

There are several species as well as natural hybrids. These were native to Malaysia, East and Southeast Asia, and China. It has been grown in China and Japan for many centuries. This was introduced to London from China by Robert Fortune, an English plant hunter, in 1846. It arrived in the U.S. in 1850. At least three species are in cultivation, including Nagamiki kumquat (*Fortunella marginata),* round kumquat (*Fortunella japonica*), and the Meiwa kumquat (*Fortunella crassifolia*).

Hardy to zone nine, these densely branched trees, sometimes spiny, are compact. Typically they're four to six feet tall with a two to three foot spread. This has alternate, compound, oval foliage, three inches long. The fruits are quite small, only 1½ inches long. Keeping well on the tree, they're eaten whole – skin and all.

These trees provide nectar and pollen for bees.

Lemon (*Citrus limon*)

Native to tropical Asia, this is a very popular citrus. It was spread around the world mostly by the Arabs who introduced them to the Middle East. They also took it to the Mediterranean area in the 7th century A.D. and to China. These were widely grown in Italy by the 16th century. Louix XIV gave lemons as gifts to his guests. The fragrant flowers decorated the tables when he entertained.

Columbus took these to Haiti in 1493 where they naturalized in the West Indies. They were introduced to St. Augustine in 1565 and later to Florida by Ponce de Leon in 1613. Apparently, they arrived in California in the 1750s. In California, they quickly spread once the missions closed. After 1950 the state became a major producer.

Hardy to zone 8b, lemons grow best in a dry climate. This fast growing, vigorous, spiny plant has an open, spreading growth habit. They're usually eight to 20 feet tall. The toothed, oblong leaves are 3½ inches long. The blooms are white on the inside and pink on the outside. Free flowering, they bloom almost year-round but especially in the Spring and Fall. There are numerous varieties, such as Meyer, which is somewhat hardier than the ordinary lemon.

Lemons can bring up to 130 pounds of honey per colony. This light yellow, premium quality honey is aromatic. The flavor varies from delicate to somewhat tart or mildly acid. The trees also yield pollen.

Although the trees require no pollination, experiments indicate that cross-pollination resulted in a fourfold increase of fruit yield. These trees need more pruning than some citrus.

Limes (*Citrus spp.*)

Native to tropical Asia, limes probably originated in Malaysia. Possibly a hybrid of the shaddock, this spread along the Arabian and North African trade routes. The Arabs introduced them to Europe. These arrived in Haiti in 1493 during Columbus's second voyage. They naturalized in Jamaica. Limes were introduced to South Carolina around 1755 by Henry Laurens. Although they thrived in the Florida Keys, hurricanes destroyed the orchards, which were never replaced.

While most citrus is budded or grafted, these are often grown from seed. Limes are small, spreading trees, eight to 14 feet tall. Hardy to zone 11, they tolerate humidity better than lemons. They're very sensitive to cold, particularly the young growth. The fruits are up to 2½ inches across. Typically, these bloom several times a year.

There are several species of limes. The most commonly grown one is the Mexican or Key lime (*Citrus aurantifolia*). This spiny, fast growing, dwarf to semi-dwarf tree bears heavy crops at an early age. It is the most important commercially grown lime. These are very prone to frost damage.

All of the limes yield lots of nectar as well as pollen.

Sweet orange (*Citrus sinensis*)

Wild oranges were probably native to India, China, and other parts of Asia. The sweet orange arrived in Europe from Persia and Syria about 500 years after the sour ones. The Arabs introduced this to the Mediterranean. Sweet oranges reached Europe in the 15th century and England in 1562. These were widely grown in European and English orangeries, such as that of Louis XIV.

Columbus introduced sweet oranges to Haiti in 1493. The Spanish took them to Florida, where the trees naturalized and were seen in 1791 by William Bartram, who traveled through the area. Oranges reached the Spanish missions in California beginning around 1739 or so.

Hardy to zone nine, this is the major type of citrus. The large trees, 15 to 25 feet tall, are nearly spineless. This has glossy, oblong to oval foliage, five inches long. The scented blooms are white. Five inches across, the fruits are sphere-like. To ripen properly these need warm temperatures. There are possibly 200 varieties, including the navels.

Washington navel was discovered in Bahia, Brazil in the early 1800s in a grove of sweet oranges. Some

grafted trees were sent as diplomatic gifts to Washington, DC. Later, this became the basis for the California citrus industry.

Orange trees yield nectar and pollen. The nectar flow, lasting about a month, is quick and heavy with California trees yielding more nectar than those in Florida. The trees produce copious amounts of nectar. The clothing of anyone working around the trees becomes soaked with the liquid. The peak blooming period can vary, depending on the location and climate. Starting as early as February 6, this extends to mid-May. Later blooming trees yield less nectar. The nectar flow is affected by weather, particularly cold and fog.

Pure orange blossom honey is considered a premium quality table honey. Among the best, this has a wonderful fruity flavor and fruit-like aroma. It ranges from almost white to light yellow. With a heavy body, this granulates within a couple months.

In California, this major honey plant provides a good honey crop every year with anywhere from 60 to 120 pounds per colony. In Florida, there is a good crop four out of five years with 75 to 175 pounds per colony. Assuming the weather is favorable, few other plants yield as much honey. Much of that sold as orange blossom contains honey from other types of citrus. It is rarely from a single floral source.

Pommelo or shaddock (*Citrus grandis*)

Hardy to zone 10, this is an ancestor of the grapefruit. It is native to Southeast Asia and China. It has been grown in China for centuries. Introduced to Spain by the Arabs, it was later taken to the West Indies by English explorers, such as Captain Cook.

Usually spineless, the dome-like trees are 15 to 25 feet tall. They have large, shiny, oblong to oval foliage, eight inches in length. The large, pear-shaped to round fruits are often larger than grapefruits. Ripening to yellow, they have a thicker skin than grapefruit. There is very little flesh, which is less juicy than grapefruit. This acid fruit is used like grapefruit.

The trees provide bees with nectar and pollen.

Pommelo or shaddock (Citrus grandis).

Tangerine or Mandarin (*Citrus reticulata*)

Among the hardiest of the citrus, this is hardy to zone nine. It does best in hot climates. Native to Southeast Asia, wild mandarins are still found in India. This has long been grown in China. It was introduced to England in 1805 and a decade later to Italy. The Italian consul brought it to the U.S. in the mid-1800s.

The spiny trees are usually shorter than orange trees, around 10 to 20 feet tall. They can vary in size from small and compact to tall and upright. In some cases they're weeping. The Satsuma variety tolerates more cold and grows well along the Gulf Coast. The Clementines are considered a variety of the mandarin.

All tangerine trees provide a moderate to high honey yield of 130 pounds or so per colony. The honey is pale yellow. The blossoms also provide pollen.

Ugli Fruit

Originating as a seedling, this was first found in Jamaica in 1917. It occurred as a natural hybrid possibly of the orange and tangerine, or the tangerine and grapefruit. Resembling a grapefruit, the fruits have a very thick, rough, loose skin that ripens to orange-yellow. The red flesh, separating easily into sections, has a distinct sub-acid flavor free of the bitterness found in grapefruit. Ugli fruit is used just like grapefruit.

These trees bring nectar and pollen for bees. BC

THE BEES AT NOB HILL


Chef Foster

Like so many places, its the chef who get things going!

Judith **Adamson**

This past Summer 80,000 honey bees were invited to take up residence at the best address in San Francisco – The Fairmont Hotel, Nob Hill. They don't pay rent, but they do a great service pollinating our new culinary garden and giving us honey. We're delighted to have them.

Many people have a deep connection to this hotel and now the bees are adding to that. This elegant Beaux-Arts landmark survived the earthquake of 1906 but was ravaged by fires inside. Architect/engineer Julia Morgan oversaw the Fairmont's renovation, hired because of her pioneering use of reinforced concrete to insure its survival in another earthquake. Time and again I hear people say things like "My grandmother brought me here for afternoon tea when I was a child" or, "I spent my honeymoon here. . ."

I arrived at the Fairmont only a few months before the honey bees. I had trained as a chef in Toronto and worked at several country inns up until about 10 years ago. At that point I decided I wanted to try cooking in hotels and see what they had to offer. I worked at the Royal York in Toronto and then the Fairmont Dallas, which is when I got interested in honey bees. My wife and I were at the local farmer's market and we ran into a gentleman dressed in a bee costume. I don't mean the white beesuit that a beekeeper wears; this was a real costume – yellow and black with antennae bobbing on his head. First I walked by and thought, that's a little odd . . . but, to each his own. He was selling honey and had a glass observation hive. I went back the next weekend and started talking to him; he was so passionate, telling me about what was going on with honey bees, how much trouble they're in and why we need them. I'm always fascinated with people who really love what they do and take it to that driven level. Here he is in a bee costume to attract people so he can chat with them. I listened to him in awe and began the process of installing hives at the Fairmont Dallas.

It took me awhile to get to the Fairmont San Francisco, but it was well worth the journey. I love San Francisco; it's an amazing playground for a chef. You couldn't ask for a better place to cook – all the restaurants and markets and fresh produce – it's all right here, and I'm totally enjoying it.

When I first arrived, I was walking in the hotel and saw the perfect spot to have beehives. There's a large roof in the back of the hotel that's easily accessed from the foyer leading to the Pavilion Room. I asked a couple of purveyors of local produce who the local bee farmer was. One guy looked at me a little strangely, but I said, "Can you just put me in touch? I've got an idea."

First he thought I was joking, but then he told me about Helene and Spencer Marshall of Marshall's Farm. They manage hives all over the Bay Area and produce wonderful honey. I got in touch with them and it became a great partnership because they really love the Fairmont and, of course, they love honey bees.

I wasn't surprised when the San Francisco management completely embraced the idea of having bees here. There are bees at Fairmont Hotels not only in Dallas, but in Washington, D.C., Canada, China and Kenya. The Fairmont has long had a reputation for concern about environmental issues and has always been a leader in the hotel industry. All our new buildings are green certified, all our hotels recycle, and whenever there's a possibility to put a garden in one of our buildings, we take advantage of that. So the Fairmont is very forward thinking about what needs to be done for the community and the environment. It's the fabric of who we are at the Fairmont to be authentically local and responsible to the community.

I've always held that belief. Coming from country inns, as a chef you're automatically connected with local farmers. They come in the back door to offer their produce, and you get to see how passionate they are. I love that, and am forging partnerships with local growers here. I always think about how we can build a partnership, and what we can offer our guests that's unique that they can't get anywhere else.

Now I get phone calls all the time from local farmers who are hearing about us. Yesterday someone called

saying, "I have 150 pounds of heirloom tomatoes that need to be used. Would you be interested?" So a pick-up came to the back of the hotel that afternoon with bushels of the most gorgeous tomatoes.

The Marshalls set up four hives. They come weekly to check them and do the honey extractions. We planted several beds of lavender for when the bees first arrived so they'd have something to grab, and they've been feeding quite regularly on that. They also fly off and forage elsewhere. Their flight path seems to be shooting straight out in the direction of the Bay Bridge, and I'm sure they're finding plenty in all the rooftop gardens in the area. There are lots of small water fountains for them to drink from, and some like to go to the penthouse for a drink. You can't blame them; I would, too.

The rest of the beds will soon be filled with more culinary herbs – rosemary, thyme, oregano, basil, chives, cilantro – whatever we can use in the kitchen. The bees will have a heyday with those herbs. It will be a very functional garden, not ornamental. The cooks will come out to the garden to cut the herbs, which will give guests a chance to interact with them and also see the bees coming and going, landing on the herbs that will land in their dinner. It's exciting because many of our guests are very much engaged with the bees. They've heard about them and want to see them. One of the first things many people ask when they arrive at the Fairmont is, "Where are the bees?" The buzz is out on the streets of San Francisco!

Guests appreciate that we're sustainable in our practices and use local, organic produce. There's so much interest these days in how food gets from the field to the plate, and people are coming in hungry to experience what's local. San Francisco is a great city for this because so many people understand the principles behind eating local, sustainable food. It's not a fad; it's just part of the fabric of the culinary rubric here.

As a chef, I think it's important to support this. The more people are aware of what we're eating, where food actually comes from, who's raising it, and what we need to do to help the environment contributes to more solutions. The fish we serve in this hotel is fresh off the pole and has got to be green; it cannot be on any endangered list. We're bringing in grass-fed meats, and now we're giving these honeybee gals a nice place to live; in turn, we appreciate their pollinating services. We're going to build a several-acres Fairmont Farm out in Petaluma where we'll grow unusual organic vegetables for the restaurant, which will fit in nicely.

After only four months we were able to harvest two supers of honey, which is quite a bit for such a short time. I use the honey in many ways – sorbets, ice creams, in our dressings, in breads. We'll bottle it as well. We're even thinking about a beer made out of our honey. This might be the only place in town to serve honey beer!

Honey is beautiful. Since I've been here, we're getting away from using plain sugar and sweeteners and going towards the honey, which we serve with our afternoon tea. We use honey it in its most natural state, leaving it alone as much as possible so the lavender or whatever taste is experienced. We do mostly cold cooking, only a little bit of hot, but not much, because cooking honey at too high a temperature kills the enzymes. If we use it in a brioche, we usually just baste the top at the end so it soaks in a bit.

What's great about having honey bees at the Fairmont is that we have an opportunity to educate people about how important bees are. Guests are everywhere, and nobody's screaming and running away because of the bees. In fact, people actively seek them out. Housekeepers, guests and colleagues like to come into the kitchen and tell me, "Wow, the bees are just flying around out there." I see people with their face pressed against the window looking out at the culinary garden and the bees. Sometimes I look up and see people staring out of their rooms at everything happening on the roof. Our banquet room has windows out to the terrace, and I get comments about how guests are walking over and staring at the bees while a meeting is going on. I try to get people who are afraid of bees to come out on the roof and look at the hives from a few yards away. It's funny how much they relax when they realize the bees don't want to hurt them, and that there's nothing to fear. I especially love that children seem so interested. When they come to the hotel we talk about food, and I introduce them to the bees and the gardens. It's great to get them at that age to really understand bees and how intertwined their future is with the future of bees.

Honey bees totally surround what I love to do for a living. As a chef, I feel a responsibility to my industry, and in addition as a human being, I feel a responsibility to help the honey bees who are in bad shape. It's been going on for years and doesn't seem to be getting any better. I don't think enough people realize the role honey bees play in the scheme of things, and that without them, we're in serious trouble. Whenever I get an opportunity to show people the garden and tell them about the bees, I'm thankful. If it helps talking to a chef and my passion comes out about what I love to do, then I'll just keep being a spokesperson.

Bees have been on this planet far longer than we have and have never needed us before. We've upset the balance so much that now they need us as much as we need them. Let's support them and get their numbers back up; let's find out what the issues are so that we can move forward for all of us before it's too late. BC

Excerpted from Backyard Beekeepers of the Bay Area *by Judith Adamson;* ***www.BackyardBeekeepersBayArea.com****. Photos by Catherine Butler, Butler Films, Inc.*

STATEMENT OF OWNERSHIP MANAGEMENT AND CIRCULATION (Act of August 12, 1970). Section 3685. Title 39, United States Code.

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OVERWINTERING

New Ideas From Old Books

Robert **Helmacy**

Why don't we make our hives more like a Honey Bee Nest?

I live at 1400 feet in the mountains of northeast Pennsylvania with a very open northwest exposure, severe winds, and temperatures as low as -10°F with long periods at an average of 10-15°F and long Winters, often from November 1 through April. Our last frost date is June 7.

I have kept bees since 2003 and like most in my area have experienced 30% to 50% losses almost every Winter. In fact, much of Pennsylvania experiences similar losses, and Mike Thomas of Bjorn Apiaries, a former Pennsylvania state bee inspector, has written, "If you want six hives in the Spring go into the Winter with 10."

But three years ago I was given a bee tree section six feet high which has changed my beekeeping life. The story follows.

In the Fall of 2008 a man called me and said he had found a dead shag bark hickory tree felled by a storm. The tree was approx. 30" diameter. 20' up was a bee hole approx. 6" in diameter. We cut out a six-foot section about 2.5' above the hole and 3.5' below, and set it upright on my farm. Now, three years later, that log hive has survived three Winters and is still thriving. I have not fed it syrup or pollen at all, only a little dry sugar each February on a warm day.

Figure 1a
Comb In Tree

Top View

My question then was, "How can bees survive in a log through three terrible Winters, when beekeepers have 40% losses?"

Part of the answer has to be the amount of insulation the tree provides. The walls of this tree are 9" thick all around, and 1" of wood is equal to about 12" of earth for insulation purposes. But I have had heavily insulated hives for several years and the 40% loss remained. There had to be something else. So I started studying the log through the top hole which I had covered with an easily removed piece of plywood and insulation. I had also examined the bottom before setting it upright. Here are some observations I made, and some conclusions and experimental procedures I have arrived at.

Observations:

- The bottom had wet debris, shredded wood etc., but I could only see from the lower end, not all the way down from the top. I wonder what happens to the dead bees?
- Comb on walls all around in vertical manner, each a few inches from the next one. Average size 8" tall, 5" out from inner wall.
- About an 11" open shaft down the middle. Bees move down in Summer, up in Winter.
- They eat sideways, no overhead food observed; I don't know if the cells slant upward. Bees can cluster in winter surrounded by food.
- The colony is always strong when it emerges in the Spring, and is consistently strong all Summer and Fall.
- The bees are large, yellow, and probably Italian or a natural hybrid.

My conclusion became: If bees can overwinter so successfully with no help in what apparently is an ideal situation, why can't I (we) duplicate that in my (our) hives?

In our hives, we talk about clusters in overwintering, but what do you see when you open a dead hive in the Spring? Not a cluster, but seven or eight lines of dead bees separated by wood and/or plastic. All food is gone where the bees are, but there often is a good supply a short distance away. But the bees are separated from the food and must traverse around the ends or over the top

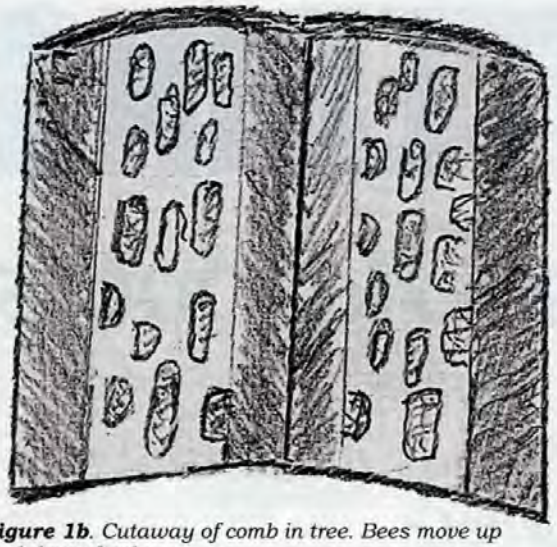


***Figure 1b**. Cutaway of comb in tree. Bees move up and down freely.*

to reach it. That means leaving the cluster one at a time to eat, and exposing themselves to cold frames and/or walls to get to the food.

A.I. Root describes this problem in *ABC of Bee Culture* in the 1880 edition, and concluded that the bees do not like traveling next to or on cold surfaces, even to get to food. He made thin pillows made from oat chaff lining the inside the hives and over the top inside the telescoping cover, and had such success that he unhesitatingly recommended all hives be packed in chaff blankets to overwinter (pp. 274-5). He did make some other suggestions people had given him, like Winter passages through the frames to encourage sideways movement without the bees having to go around or over the frames and getting chilled, but never says he actually tried it.

TWO EXPERIMENTS IN OVER-WINTERING

Before the bee tree was found, I had made a first experiment in changing overwintering procedures by putting triangle-shaped holes through all 10 frames in a deep hive body with the largest holes in the center frames and getting progressively smaller toward the outside edges. I put this on top of another deep, and allowed the bees to fill it in the Fall honey flow. The bees wintered successfully in a windy northwest exposure. The second year, I added a medium honey super above, which I harvested in July, allowed the bees to refill in the Fall flow, and again left the deep with triangle cutouts in for the Winter. Again the bees overwintered in good shape. Unfortunately, during the following Summer, a mouse chewed its way through a wooden entrance restrictor and killed the hive. With a better mouse guard, I think this method is feasible. Incidentally, the bees did not fill in the triangle holes, although a little comb was evident in the corners of one or two of them.

After acquiring and studying the bee tree, my second experiment was to try to provide an open space similar to that in the tree, in which the bees could cluster free of the frames running through them. Procedure: To do this, on or about November 1, I refigured my eight hives as follows: I started as usual with a hive stand with a slanting landing board, and a screened bottom board with a closed but removable plastic sheet underneath. On these I started with the standard deep with 10 deep frames with honey and brood. Next I removed the four least-filled frames from the second deep so I could leave a four-frame hole in the center of deep number two. That left three frames on each side in number two with honey, brood and pollen left in. Above that I put a *medium* super with six *shallow* frames of honey in the center and two medium frames with honey on each side. This created a T-shaped opening in the upper two boxes so the bees could move up and down in a real cluster and move outward to access the honey above and below without touching the outside walls.

Above this, instead of a standard inner cover, I put a triangle escape board with the triangle down to keep the bees *IN* the hive, not allowing them up against the telescoping cover, even though it was insulated.

On top of the triangle escape board, I put a telescoping cover lined with a piece of 3/8 bubble house wrap of aluminized plastic. The cover was left closed all Winter, allowing ventilation through the front entrance only, which was covered with a ½" hardware cloth guard shaped to fit over it.

The outsides of the hives were wrapped on three sides with 3/8" aluminized plastic bubble house wrap, painted green on the outside to absorb the sun's heat as much as possible. The front was not completely wrapped due to its southern exposure and the front entrance was only covered about an inch or two on each side from the wrap extending around. All was duct-taped together to seal out moisture under the telescoping cover and in one or two cases where the wind was fierce, I put an extra piece of the same wrap over the top to better seal it.

I closed up the screened bottom board in November and left it closed until after the danger of late March snows was past, as they can blow snow up from underneath and freeze a strong hive that still has ample food. I left the outer wrap on until the danger of hard freezes was past (mid to late May where I live).

The removable board under the screened bottom board was left closed all Winter from November 15 to April 15, when it was opened about 6". On May 5, I removed it entirely when the warmer weather hit. I removed the outer wraps on May 10-11, although they could have been left on longer. (A.I. Root recommended that hives be kept warm right into mid-June.)

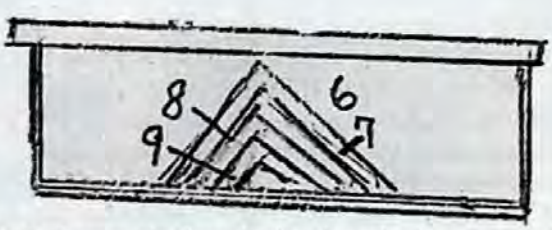


***Figure 2**. Frames six through nine through view. Frames two through five mirror these holes for lateral movement.*

On most hives, I left the mouse guard on for the Summer, but in one or two I removed it because the bees seemed to be having trouble negotiating it and some pollen was being stripped off their legs as they entered through it. (Eventually they learned to get through it without losing pollen, however.)

As of April 14, all eight hives were alive, although hive number seven was dwindling. When I opened it I found a dead mouse which had either chewed its way in through the one-inch upper hole in the super, or somehow been missed when I closed up the hives for the Winter. The hive had a bad ammonia smell – I suspect from mouse urine – and it succumbed by April 25. So eight out of eight survived the Winter, and one died from a mouse habitation after that.

Tested Version

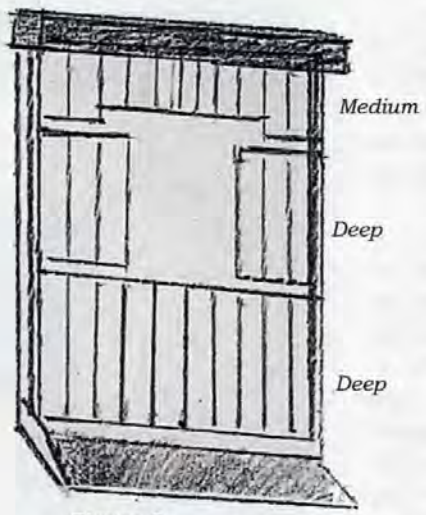


Figure 3

I replaced it with a split from number eight on May 6, and number four swarmed and the swarm became hive number nine as of May 12. So I started the honey flow with nine hives rather than the usual four or five out of eight. On May 15 another hive swarmed, and I hived it and had ten viable colonies by June 1

While this was a welcome, if unprecedented success for me, some problem areas are still to be solved.

1. Exactly when is the best time to open the hives to put in full length frames? In some hives, because I waited for warmer weather, the bees had built burr comb down from the shorter frames and had begun raising brood in it. I left this to solve in the Fall. In others there was a mish-mash of comb in part of the open space.
2. I suggest removing the triangle escapes early in the Spring, when you first check your hives. However, that opens the question as to whether you replace it with a regular inner cover or not.
3. Regarding triangle escapes, they can substitute for an inner cover with the triangle up for normal use, allowing bees to get out; but no robbers in. Homecoming bees will enter through the bottom entrance or extra holes in the supers. You can also put the triangle down when hiving swarms or packages so bees can get in but not out.) Spiders tend to want to nest under the screen of the triangle escapes and impede the passage of the bees.
4. In our climate there are more cold days in the year than warm ones. Since bees are able to cool warm hives if they have adequate ventilation, I opt for painting my hives dark colors to absorb more sun (and therefore heat). I prefer green because it blends in well most of the year and so does not call unwanted attention to the hives. Proof this works: Hives painted darker colors, when placed side by side with lighter ones will have more bees flying earlier on sunny mornings.

I present a few thoughts from A.I. Root in his original "ABC of Bee Culture" on overwintering, published in Medina, Ohio in 1880:

- No drafts or cracks which might admit cold air can be allowed.
- All hives must be built up by feeding sugar syrup after the September honey flow is done. If some are still too weak, combine them into strong ones. (N.B. My warning: feeding sugar syrup too close to clustering time can result in uncapped liquid which may evaporate and soak the hive, killing the bees.)
- He strongly recommended oat chaff sewn into thin cushions made of muslin to pack around and over the frames and separated from the bees with a very thin board (for cleanliness) to keep the bees warm.

- He wanted the hives to be very warm even into June.
- He favored large wind breaks for hives (suggest 8' high) on the north and west sides. (My note: could also be on east side to protect against nor'easters, as long as it does not block sunshine.)
- He says bees will not travel around the ends of frames in colder weather because they do not want to get against the cold wood of the outside surfaces. Root mentions "winter passages" on page 275 (bottom right hand column) which I take to mean holes cut through frames to provide lateral movement without touching outside walls. (This idea is similar to my triangle hole – see above – and one company makes a hole in their frames, although it is small and low and in a corner. I have not tried them.)

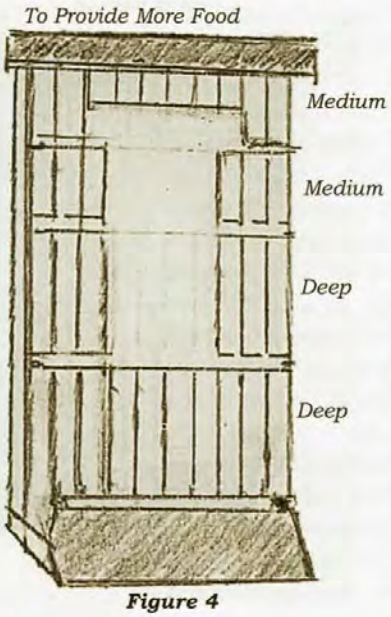


Figure 4

In summing all this up, bees need a lot of food and warmth to survive long severe Winters. The traditional frame-filled hives do not offer a real clustering opportunity for adequate warmth or the chance for bees to get to food stores without separating from the cluster and getting chilled and possibly dying. If beekeepers in severe climates can better insulate the outsides of their hives and leave a large space inside for a tight cluster that still allows easy access to all the stored food without the bees getting chilled, I think they would have many more hives survive the long Winters. BC

Robert Helmacy keeps his bees near his home in Lathrop Township, Pennsylvania.

A Beekeepers Prayer

Oh Lord, I ask you please,
Let fortune smile on our bees.
Don't rain on them and cause the muck,
That gets them mired ...still on the truck.

Keep the fire ants at rest. Don't let one come out to play,
when they do the hot-dog test, at some border ...on the way.

Small hive beetles? Keep them down.
Don't let them wolf my patties down.
Keep Varroa small in number. I know they're there.
Just let them slumber. (I may save a little hair.)

Let CCD just fade away. You did this once before, I know.
I've enough to do today. If you please, just let it go.

Keep the foulbrood from resistance. Don't let it change its' current guise.
I know you like to test persistence. I'll keep praying 'till it dies.

Don't spawn a tracheal mite recurrence.
We're winning now with some assurance.
Were you just feeling mean that day?
Seems cruel to take bee-breath away.

Chalkbrood, Stonebrood. Sacbrood too ...
You sent my way to test my mettle.
Have I proved a warrior true?
Or is there more to settle?

Please get my bees to the almond trees; they wait out there with breath abated.
Six-hundred-thousand-acres! Good bees/good nuts... it's all related.
Let most find their way back home, for a pampered month or two.
I'll feed them up, we'll make new comb. We'll find new fields and start anew.

I'm glad we had this little talk; I'm trying to protect your bees.
I walk a sometimes stony walk. That's why you find me on my knees.
One last thing I haste to mention. Thanks for the ....Apis invention!
And at my grave, let it be said: "Here lies a 'keeper... dead."

Dick Marron

BEESWAX – IT'S ALL ABOUT THE CLEANLINESS

Ann **Harman**

Whether you're making candles or skin creams – you're beeswax has got to be clean!

Last month the East Cupcake Beekeepers Association had a joint meeting with the West Gumshoe Beekeepers Association to have an educational honey show. It was a great success so this month the WGBA is hosting the beeswax part of the show.

Remember, this show is not about losing points in a fierce competition but rather to discuss what makes a good block of beeswax and a pair of candles and novelty items such as ornaments. Products made with beeswax, such as lip balms and skin creams, can be included. So you see that this beeswax show can have many different classes but not everyone will enter all of them.

Beeswax, as it comes from the hive or the cappings tank, is simply not clean. Pieces of bees, bits of propolis, honey, slivers of wood from frames and other unidentified things are present. If candles made with dirty wax are burned the resulting sparks would be more suitable for 4th of July celebrations. Someone using a hand cream would be puzzled about small lumps of "stuff" and decide that the cream was dirty – which it is. Lumps also make molded items such as candles and ornaments unattractive.

So where to start? A common class in shows is the simple block of beeswax. This is, after all, the starting point for everything made from that wax. The block is ready to be used for candles, ornaments or products.

The size of the block is governed by the show rules and they vary. Some shows want a one-pound block, others a two-pound and some even want a larger block. The size of block for this show needs to be determined by the two clubs. A one-pound block may be the most suitable size especially if many beekeepers have been keeping a few hives for just several years.

What about a new beekeeper in the second year of beekeeping and made one or two supers of honey? The amount of wax is very small. They can have a class. The equipment supply companies that sell candle molds have a mold that makes a simple one-ounce bar. The mold will make five bars but the new beekeeper could enter just one or two bars. Actually these bars sell very well to sports people, quilters, carpenters and others. It is always interesting to ask just what the customer is using the small block for. Encourage entries so a new beekeeper will learn how to clean beeswax for making candles and other products.

So the classes are: block of beeswax (size to be determined), beginners small block of beeswax, molded candles (tapers) – enter three, perhaps a class for novelty candles, ornaments (depends on interest), and beeswax products. In the novelty candle category you can choose to have colored candles, such as ones appropriate for a holiday.

The entry for molded candles is three because one of the candles will be lit and burned for a short time. Someone in the clubs can bring a candle holder. Burning the candle will be a way to judge the wick and also the cleanliness of the wax.

Everything sticks to beeswax (unlike honey that sticks to everything). If someone brings an unwrapped block of beeswax you have just found the first topic of discussion. If bits of unidentified dirt are stuck on the surface of the wax the beekeepers can easily see that this dirt will become incorporated into whatever object is made with the block.

Someone is sure to bring wax in a fancy mold. All the others are plain blocks probably poured in various baking pans. Point out to the new beekeepers that nothing in the judging criteria says anything about awarding points for fancy molds. A fancy mold is judged as if it were a plain mold.

Beeswax is relatively soft and easily dinged or marred by fingernails or coming in contact with some object. Actually such damage does not affect any of the uses for the block; it is merely esthetic. However, the beekeepers should know that in a real competitive show points would be removed for blemishes.

Now for dirt in the wax. Put all the blocks bottom-up. Have everyone look carefully, without touching, at the bottom of each block. Since dirt falls to the bottom of the mold any should be visible. Now take a minute and have everyone look at the tops of the candles. The top of a candle is the bottom of its mold.

Beeswax is supposed to have a

characteristic aroma. The more it has been heated the less aroma. So everyone can take a good sniff of the blocks and candles. Any peculiar or off odor should be noted as well as a total lack of aroma.

The color of beeswax is a very interesting topic. Most shows indicate that the color can range from straw to canary yellow. When the bees produce wax in their wax glands and secrete it, it is a whitish color. However in the hive it is exposed to colorful pollen. Propolis colors probably make a small contribution. So in areas of colorful yellow pollens, the beeswax would be quite yellow.

One year I had some beeswax that was a nice but distinctive yellow. Although the candles from this wax would probably have won a prize at a honey show, they were turned down by a customer who said that yellow did not match her dining room décor. It is important to keep customers' desires in mind.

One other factor can influence the color of beeswax. In some areas of the country the tap water or well water contains iron. Using this water for cleaning wax results in a rather unattractive dirty-khaki color. The only ways to produce show-quality honey would be to use distilled water or have a certain kind of water filter installed. Or a beekeeper could take the wax to another area with no iron in the water for cleaning.

Liquid wax expands as it is heated and shrinks as it cools. In addition, rapid cooling from liquid sometimes results in cracks. If a block with cracks has been brought, it can be the topic of discussion. Be sure to thank the member who brought a cracked block of beeswax.

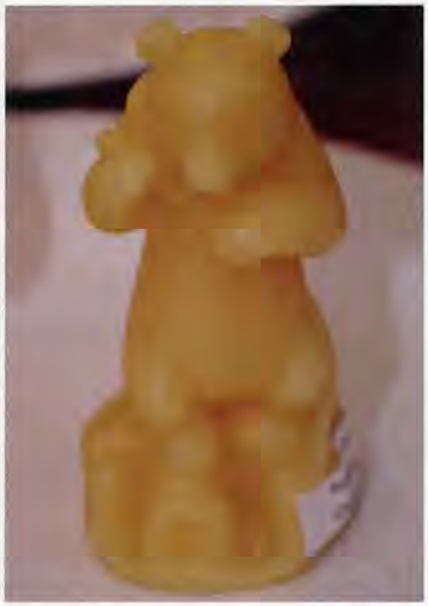
The candles have already been examined for dirt. All three must be of the same length and identical in all ways. Now have everyone look at the bottom of the candles. Did someone forget to add wax as the candle shrank while cooling? If so, here's another educational moment. Every commercial candle has a smooth finished bottom, and so should handmade ones.

Now it's time to light the candles. Just be certain there is no strong draft in the place where the candle are. Just light one of the three and let it burn for just a few minutes. Easy to light? Sputters and smokes? Oh oh – probably dirt.

Novelty candles are popular with customers. So many interesting molds exist – ones for holidays, fancy ones and ones just for fun. The actual shape does not matter. What does matter is the cleanliness and the bottom finishing details. Since the molds have excellent detail the candle should be as detailed also. Since fancy shapes frequently sit on flat surfaces unlike tapers in a candle holder, the fancy candle should sit perfectly upright when viewed from all angles. If one happens to sit tilted, use it for education (don't forget to thank the beekeeper who brought it).

Many beekeepers think that all customers should appreciate pure, uncolored beeswax even in novelty candles. But customers may prefer a green Christmas tree. So perhaps a class for colored candles would be fun. It is difficult to get a good color in a candle, especially with the very strongly yellow color of some wax. So in a class for colored candles, a good color is very important. If a candle has a "muddy" or even a strange color, another color of dye might have been better. An alternative is to bleach the wax before adding color. Bleaching is essential for pastel colors.

Lip balms and hand creams using beeswax have become very popular. As in all cosmetics the container is important. Explain that the suitability of the container is one of the criteria being examined. The contents need to be tested by everyone. For lip balms, whether in tubes or in small flat tins, it should be applied to the skin since testing on lips would not be sanitary. The skin on the back of the hand is a good place. That is also a good place to put a small dab of a hand cream.



Fragrances are frequently added to both lip balms and hand creams. Yes, that would be part of the criteria. Although fragrances would be subjective – similar to flavors of honey – if the aroma is suitable to the product and not overpowering, then it is completely acceptable.

How is the back of your hand? Sticky? Greasy? Let's hope it feels nice and smooth. Encourage everyone to comment on the entries. If a favorite one appears then the comments would be helpful for someone who wishes to make such products.

So the beeswax show is now over. Perhaps a few will have to clean their block of wax again. Perhaps the sputtering candle will have to be melted down. Let's hope that the new beekeepers who entered their little block will return next year with a big block, three candles and some hand cream.

The two clubs, ECBA and WGBA, are to be congratulated on hosting two excellent educational shows. All their members who attended are keeping the ancient tradition of agricultural shows. It's about producing a quality product. BC

Ann Harman keeps her bees and gathers her beeswax at her home in Flint Hill, Virginia.

PROBLEM WOODPECKERS IN THE UK

Peter **Smith**

Green Woodpecker

There are three species in the UK and they really love what's inside those hives, especially the Green Woodpecker.

Here in the UK, we have three species of Woodpecker: there's the Green one, so called because it's predominantly green but with a red head and yellowish underbelly. This is the largest of the three. Then there's the Greater Spotted one, mostly black and white with a red head and under tail. This one comes round and makes free use of any bird tables in gardens, and then there's the Lesser Spotted, similar to the Greater but much smaller (about the size of a sparrow.)

All three visit my garden and, unfortunately, one likes my beehives. Or, rather, the contents of them.

They usually announce their presence in early Spring. The Green one flies about making a loud 'few, few, few' noise which sounds quite tropical. The Greater Spotted one claims its territory by 'drumming' at eight or 10 blows a second on branches in trees in the nearby wood. The birds are often heard competing with one another. The Lesser one does the same thing, but at around 15 blows a second.

The Green one likes ants. One spent a very happy 20 minutes digging up a flower bed in the garden to gorge itself on ants and larvae from a nest that it had uncovered – pausing only for a scratch when the ants retaliated. Unfortunately, it is also partial to the contents of beehives – particularly the larvae.

Woodpecker damage to 'Commercial' hive. See through the four inch hole that the frames inside are also damaged.

Last November, there were already reports of damage to hives caused by Green Woodpeckers, so it was already time to install some protective devices. I have used different things in the past, all with varying measures of success.

I have tried wrapping the hives with thin plastic 'cling film' (Saran wrap). This tactic successfully kept the birds at bay as they couldn't grip on the sides of the hive, but failed miserably because damp got in under the plastic and saturated the woodwork which then couldn't dry. A damp beehive is definitely not good for bees so the cling film directly on the woodwork was quickly abandoned. Instead, I put pieces of 2" x 1" vertically in the middle of each side and wrapped the cling film over that (see photo). The hive didn't get wet and – if it did – circulating air would allow it to dry.

However, although this had been successful in the past, this year the birds worked out some fiendish plan and managed to make holes in the cling film. Back to plan 'B.'

This time, as in previous years, I hung up some unwanted CDs in the small trees round the hives. These spin in any breeze and have, in the past, kept the birds at bay with the flashing light. I also made a wooden cross, about six foot high and a couple of feet wide from 2" x 1" timber, and pinned an old shirt to it. A CD, suitably painted to represent a face, completed my version of a scare crow This was placed a few feet from the hives and almost gave the Farmer a heart attack when he walked his dogs along the nearby track.

Great Spotted Woodpecker

I kept my eyes on the hives during the Winter and all appeared well, but in early March I had a phone call from the farmer to suggest that I went and looked at the hives. He thought that they had been the subject of attention from Woodpeckers which, it turned out, was something of an understatement. I put some pieces of 3/4" plywood in the car with a drill and some screws and, with deep sense of foreboding, sallied forth.

We were having a particularly cold Winter and any

Damaged frames and comb.

Hive wrapped in cling wrap. Woodpecker damage halfway down front.

disturbance of the bees wouldn't bode well for the health of the colony. March is often a time here when colonies succomb.

On arrival at the hives, it was evident that one hive had received more than its fair share of attention. There was a four inch diameter hole through the ¾ in thick wood in the front of the brood box and the side bars on the first four frames inside the hive were pecked right through. Some bees were still present in a cluster at the back of the hive. I cut a piece of plywood and screwed it in place over the hole.

Fortunately, the other hives seemed to have avoided any serious attention from the Woodpecker(s). However, one nearby hive had evidence of the start of an attack and the join between two boxes had been slightly damaged.

A couple of days later, I re-visited the hives with a supply of fondant* and – just in case – some more plywood and screws. It appeared that the birds had taken umbrage at the repairs to the hive and had decided upon revenge. One hive had been attacked on three sides and the previously repaired one had a new hole in a hitherto undamaged side.

Instant repairs were carried out in the freezing conditions but one colony was already beyond help. Large helpings of fondant were put over the cluster in the other hives with the hope that all was not lost and sustenance would reverse the situation.

The scarecrow looked on in the snow and frost as the CDs spun near the hives. For about three weeks all was well but then disaster struck. The cold and damp had finally finished the colonies off. In common with a lot of other beekeepers, I had become a victim of the Woodpeckers.

After the event, the know-alls said "Well, of course what you *should* have done is..." The most popular idea – which I abandoned several years ago – was to make a wire netting cage which is fitted over the roof and sides of the hives. These need to be a cube with about three foot square sides and top and held in position so that the wire is about five or six inches away from the woodwork. The mesh needs to be small enough to stop the birds actually reaching the wood work: some people use netting with 1" mesh, some use larger mesh.

The problem with these cages is that they are a definite nuisance. Unless made on a substantial wooden frame, they flop about and deform easily when lifted and can be affected by strong wind. My hives were on hive stands made from 3" x 3" timber six feet long, so the wire cages would not stand on them anyway.

So, after 20 years of beekeeping, the 'peckers won

the battle for one Winter. It *was* an exceptionally long and cold Winter which, I suppose, contributed to the woodpecker's need for some tasty larvae.

They still come and feed off the bird tables in the garden and I enjoy seeing them. Still I wish they'd done less damage to the hives.

I'll have to think of something more secure for the coming Winter. BC

Lesser Spotted Woodpecker

** Baker's icing sugar – available from the local baker at £12.50($19.42) for 12.5 kg (27 lb) block.*

Peter Smith lives just outside London, where he keeps his bees, gathers swarms, teaches beginning classes and battles the woodpeckers.

Repaired hive. The woodpeckers subsequently made large holes in both sides and rear of hive. The colony died out.

GLEANINGS

NOVEMBER, 2011 • ALL THE NEWS THAT FITS

OBITUARY

Thomas Edward Burleson, Jr., died September 19, 2011, at Baylor Hospital in Dallas, Texas. He was born November 20, 1935, to Thomas Edward Burleson, Sr., and Annie Laura Whipple Burleson in Waxahachie, Texas. He was preceded in death by his parents and a daughter, Lori Burleson Johnson. He is survived by his wife of 54 years, Nan Epton Burleson, and children: Gregory Burleson and wife, Carol; Timothy Burleson and wife, Tami; Ame Burleson Solomon and husband, John; and son-in-law Lee Johnson.

Burleson received a Bachelor of Business Administration degree from North Texas University. Upon graduation, he received his commission as a Second Lieutenant in the United States Air Force. He was stationed first in Amarillo and then near Washington, D.C., at Andrews Air Force Base, where he was promoted to Captain and became the chief refueling officer for the base. Among his duties there was refueling the Presidential aircrafts. In 1962, he was honorably discharged from military service and returned to Waxahachie to join the family firm of T.W. Burleson & Son, Inc., where he worked 49 years as the third generation in his family to produce and pack honey. During that time, he served as president of the National Honey Packers & Dealers and president of the American Honey Institute. As CEO of Burleson's Honey, Burleson led the industry by pioneering plastic, non-drip containers for honey.

COURT VOIDS WOLFF SUBSIDIARY SUIT

A federal court blocks U.S. government plans to sue a German food importer's American subsidiary for allegedly avoiding $80 million in customs duties on illegally imported Chinese honey.

A federal grand jury last year indicted Alfred L. Wolff Inc. and its subsidiaries in the U.S., Germany, China and Hong Kong, charging they dodged the customs duties on honey imported from China between 2002 and 2009.

It was alleged Wolff labeled the honey as originating in other countries to avoid anti-dumping duties.

Wolff appointed a limited-authority corporate representative to appear in court to enter a not guilty plea and when it did so, the government served the representative with summonses for each of the foreign defendants.

Wolff moved to quash the summons, saying the method of service did not comply with federal rules of criminal procedure.

Media reports say the government countered that special circumstances necessitated an exception to this rule, but U.S. District Judge Amy St. Eve rejected this and granted the motion to quash.

Her judgment says the federal rules require the government to serve each defendant by delivering a copy of the summons to an officer, a managing or general agent, or another agent appointed or legally authorized to receive service of process.

The judge says service on a subsidiary does not constitute service on a corporate parent where separate corporate identities are maintained, even if the subsidiary is wholly owned by the parent.

The court says the government must find another way to serve the foreign defendants in accordance with the U.S. mutual legal assistance treaties with the countries in question. – *Alan Harman*

GM POLLEN A NO NO!

The European Court of Justice upheld the rights of beekeepers and consumers to keep honey free from GM contamination.

Europe's high court ruled in Brussels that honey contaminated with genetically modified (GM) crops would need full safety approval and would have to be labeled as GM.

Environmental group Friends of the Earth Europe says the ruling opens the way for Europe's laws on GM crops to be strengthened.

"This is a victory for beekeepers, consumers and the movement for GM-free agriculture in Europe," group's food campaigner Mute Schimpf says.

Honey should remain free of contamination from the biotech industry. This ruling rewrites the rule book and gives legal backing to stronger measures to prevent contamination from the likes of Monsanto.

The court ruling confirmed that existing laws that allow traces of unauthorized GM contamination are insufficient and need revising.

The ruling was the result of a legal challenge from a German association of beekeepers who took the Bavarian government to court following the contamination of honey from a governmental field trial of Monsanto's maize MON 810.

The case was forwarded to the European Court of Justice, which was asked to rule whether honey containing GM-pollen is defined as a GM product and if any trace of a GMO in honey needs an authorization as a GMO.

The court said it does needs special authorization before it can be sold in Europe.

The German beekeepers are seeking compensation for honey and food supplements that contained traces of pollen from genetically modified maize.

The beekeepers had their hives near site where the Bavarian government was growing MON 810 maize for research purposes.

In its judgment, the court observes, first, that the pollen in question may be classified as a GMO only if it is an "organism" within the meaning of the directive and the regulation, that is to say, if it is a "biological entity capable" either of "replication" or of "transferring genetic material.

It ruled that since it is common ground that the pollen in question has lost all specific and individual ability to reproduce, it is for the referring court to determine whether that pollen is otherwise capable of transferring genetic material," taking due account of the scientific data available and considering all forms of scientifically established transfer of genetic material.

The court concluded that a substance such as pollen derived from a variety of genetically modified maize, which has lost its ability to reproduce and is totally incapable of transferring the genetic material which it contains, no longer comes within the scope of that concept.

But it ruled that, nevertheless, products such as honey and food supplements containing such pollen constitute foodstuffs which contain ingredients produced from GMOs within meaning of the regulation.

In that regard, it found the pollen in issue was "produced from GMOs" and that it constitutes an "ingredient" of the honey and pollen-based food supplements. It ruled pollen is not a foreign substance or an impurity, but rather a normal component of honey, with the result that it must indeed be classified as an ingredient.

"The pollen in question consequently comes within the scope of the regulation and must be subject to the authorization scheme provided for thereunder before being placed on the market," says statement.

It said the authorization scheme for foodstuffs containing ingredients produced from GMOs applies irrespective of whether the pollen is introduced intentionally or adventitiously into the honey.

Last, Court ruled the authorization obligation exists irrespective of the proportion of genetically modified material contained in the product in question. – *Alan Harman*

CERANAE IN UK/SCOTLAND AND IRELAND

Nosema ceranae has been confirmed in Scotland for the first time.

The government's Science and Advice for Scottish Agriculture (SASA) says three samples of bees it received for analysis tested positive.

The three cases are from three different regions of Scotland, indicating the disease is not confined to one area.

SASA says the disease now appears widespread in Europe, with many cases recorded in England, Wales and Northern Ireland.

A 2007 survey by the National Bee Unit identified Nosema ceranae in six counties of England and three in Wales. A report by the Agri-Food and Biosciences Institute laboratory in 2010 identified Nosema ceranae infections in hives from three counties in Northern Ireland.

One of the positive Northern Ireland samples came from attendant workers with an imported queen from the neighboring Republic of Ireland. The other three samples were from local colonies, with no evidence of importation.

Alan Harman

DDT STILL HERE

Despite being banned almost 30 years ago, the pesticide DDT is still being widely found in human bodies, one of a toxic cocktail of substances detected in recent study.

Health researcher Tze Wai Wong of The Chinese University of Hong Kong says that in a study of 146 human milk samples, most of the persistent organic pollutants found belonged to the DDT group.

"DDT was only one type of contaminant that we found," Wong told a conference in Adelaide, Australia. "There were also dioxins, other organochlorines and banned pesticides that were once widely used in agriculture.

"Finding them in human milk indicates these pollutants are still present in food chain, which means that they're highly persistent and have a slow decline rate, or, worse still, they are still being used in some countries in food production– neither of which is good news for consumers."

Wong says the human uptake of dioxins and other POPs is mostly from contaminated food products that originate from places with heavily polluted soil and water. Dioxins can also enter the body through contaminated air.

"This problem is not confined to the Asia-Pacific, but can be found across the world," he says. "Apart from previous use of toxic pesticides, the community's diet, its methods of waste disposal and its level of industrialization can contribute to the uptake of POPs as well."

For example, nations that produce more industrial waste risk the contamination of marine products when the waste is dumped into the ocean, he says. Countries that incinerate their waste, such as Japan or China, are particularly susceptible to dioxin contamination of food, as it is often released through burning.

"We suspect that high concentrations of DDT will be found in communities which consume large amounts of seafood, dairy products, cattle and poultry, as animals tend to bioconcentrate these toxins," he says. "In this case, Western Europe, Scandinavia and Japan are particularly at risk.

Alan Harman

ROOFTOP FOOD

Building developers in the UK are being told to include food-growing areas on the rooftops, balconies and walls of new schemes for the coastal city of Brighton.

The Brighton and Hove Council says demand for garden allotments is so high that food-growing areas atop commercial and residential buildings will be a selling point.

A planning advice note says the council supports the provision of food growing opportunities within the city as part of its commitment to sustainable development.

"Urban food growing is an international movement now being taken seriously by both policy makers and planners as a way of achieving a range of diverse benefits," the framework note says.

"The inclusion of food growing areas in new developments extends beyond the conventional provision of gardens and allotments in that it might include the creative use of roofs, walls and balconies where external space is limited."

It could also include landscaping with edible plants rather than ornamental trees and shrubs.

The city, 53 miles south of London on the English Channel, says there are many benefits associated with food growing, including improving the physical and mental health of residents, increasing biodiversity in cities, reducing carbon emissions associated with long-distance food distribution and greening the urban landscape.

Green walls and roofs can improve the performance of buildings by regulating temperature and contributing to energy savings and reduced carbon emissions. The application of green walls and roofs to include productive plants is a developing technology with innovations emerging all the time, it says.

The planning advice note applies to new build commercial, residential and mixed use developments, and if applicable, to conversions. It is intended to be used by developers and planning officers and members of the public as a guide to what might be achievable depending on the specific context of the development.

"How food growing can be incorporated into new developments will be subject to a range of variables dependent on the purpose, scale and location of the development," it says.

Developments with no land available for gardens could consider using rooftops, walls or balconies as growing spaces.

Residential developments are seen as having an obvious group of people to grow the food, but in other situations the report says thought will need to be given to the on-going management of the growing space and who will harvest the produce.

The guide says growing spaces should be south facing. Food plants require exposure to direct sunlight during the growing period. If this is limited it may not prohibit food growing but it may restrict the choice of plants to those that require less light.

Any food growing will need a reliable water supply. Incorporating rain water collection into any design is desirable, but easy access to mains water may also be necessary.

Rooftop growing may also require a more lightweight growing medium, while the provision of on-site composting should be designed to help manage organic waste generated within the development.

Building planners also will ⇨

HAND HELD TEST CAN DETECT PESTICIDES ON FRUIT, VEGETABLES

Technology that can test for chemicals on standard and organic produce on the store shelf has undergone its successful first test.

In the technology's first venture out of the lab, Purdue University researchers took their miniature mass spectrometer grocery shopping and identified specific chemical residues on apples and oranges in a matter of minutes without having to peel or otherwise prepare a sample of the fruit.

Chemistry professor Graham Cooks and biomedical engineering assistant professor and Zheng Ouyang tested for a fungicide on oranges and a scald inhibitor on apples.

"We're trying to take powerful, sophisticated instruments out of the lab and into the real environment where they could help monitor fresh produce all along the supply chain from production and supply to the consumers," Cooks says.

"This technology has the capability of testing for bacteria as well, such as *E. coli* or *salmonella*, and it only takes a matter of minutes as opposed to hours or even days for a standard laboratory test."

Mass spectrometry is a commonly used analysis method known for its sensitivity and accuracy, but most mass spectrometers require a sample be specially prepared and placed in a vacuum chamber for analysis.

Cooks and his team developed a technique, called ambient ionisation, that allows critical steps to be performed in the air or directly on surfaces outside of a mass spectrometer. Molecules from the sample's surface of the sample are then vacuumed into the equipment for analysis.

Conventional mass spectrometers also are cumbersome instruments that weigh more than 300 pounds. The model Cooks' team developed, called the mini 10.5, is a handheld device roughly the size of shoebox that weighs 22 pounds.

"Accuracy is the price we pay for a much faster, cheaper and easier technology that can be taken out into the field almost anywhere," Cooks says. "The minis are not as precise as a standard mass spectrometer, but it would be a good first line defense to indicate when additional testing is necessary."

Purdue pesticide programmes co-ordinator Fred Whitford says the ability to sample food quickly will be a great benefit to the regulation industry.

"Sometimes a test result comes too late and the food is already out, which can be a serious problem," Whitford says. "Currently only about 2% of the food is pulled and tested, and perhaps a faster and cheaper test would allow more samples to be taken."

Whitford says the U.S. Department of Agriculture's most recent report stated chemical residues exceeded the legal limits on 0.3% of the samples tested, while 2.7% of the samples tested were found to have pesticides not approved for that crop,.

"Chemicals can be misused in a variety of ways," he says. "Sometimes they are applied in the wrong amounts, sometimes the crop is harvested too soon after chemical application and sometimes a chemical is used that is not approved."

The first field tests were limited to detecting the fungicide benzimidazole on oranges and the scald inhibitor diphenylamine on apples. Scald is a brown discoloration that appears on apples during storage.

"We could easily distinguish between treated produce, which had a strong signature for the chemicals, and organic produce, which showed no chemical residue on its surface," graduate student Santosh Soparawalla says.

The team tested two ambient ionisation methods. Both involve ionizing molecules on a sample's surface. This ionisation step gives charge to the molecules and allows them to be identified by the mass spectrometer.

In the first method, called paper spray ionisation, a sample is wiped with a common lens wipe wet with alcohol. A small triangle is then cut from the wipe and placed on a special attachment of the miniature mass spectrometer where a high voltage is applied.

The mixture of alcohol and residues from the sample's surface become fine droplets containing ionized molecules that pop off of the wipe and are vacuumed into the mass spectrometer for analysis.

In the second method, called low temperature plasma ionisation, a special probe sprays a collection of charged particles onto the sample's surface using a slow stream of helium gas. The charged particles ionise molecules on the sample's surface, which then bounce off the surface and are vacuumed into a mass spectrometer for analysis.

"This could be the first step toward a day when everyone will have the ability to make an informed decision of what they want to purchase and eat based on an analysis of the specific items," Soparawalla says.

The team also evaluated the quantities of diphenylamine, or DPA, present in a treated apple. The U.S. Environmental Protection Agency's limit for DPA on an apple is 10 parts a million. The tested apple had an estimated 15 parts a million, but the margin of error for the test is large enough the concentration could easily be within the regulated limits.

"These tests of apples demonstrate how this technology could be a part of a larger regulatory system," Cooks says. "The experiments were not a robust scientific examination of the levels of chemicals present on produce.

"The test is what's called a factor of two test, meaning the actual concentration could be half or could be twice as much as the approximation. The results were not statistically above the legal limit, but it is food for thought."

Cooks says the team also examined the distribution of the chemical in a cross section of the apple and found DPA throughout, with the greatest concentrations in the skin and near the core of the apple.

"It appears that washing or peeling an apple may not reduce one's exposure to the chemical much," he says. "If the approximate levels held true, eating one apple a day would bring a person to the daily limit of exposure to diphenylamine."

Benzimidazole was found to be limited only to the skin of the orange.

Alan Harman

Rooftop ... Cont. From Pg. 75

need to take into consideration the fact heavyweight materials such as compost and tools may be needed for rooftop or balcony growing.

Adequate provision for the storage of tools and associated equipment will need to be integrated into the design as well as plans for the management of the growing areas.

Green roofs are categorized as extensive or intensive. Extensive green roofs tend to consist of non-productive plants and are designed for energy efficiency or water management. They are not usually generally accessible.

Intensive green roofs are designed to be accessible for either food growing or other recreational activities. Intensive green roofs will require deeper soil levels to support shrubs, perennials and even trees. Beds for growing can be incorporated into the roof at the time of design/construction or they can be added as containers after completion.

"Loading capacity for green roofs should be addressed at the design stage," the note says.

The council says the design of balconies can provide small spaces for individuals to grow a limited selection of plants and are particularly suited to high density residential developments.

Planting containers and window boxes can be incorporated into balcony design, while railings and structures joining neighboring balconies can be designed to support climbing plants. Loading capacity for containers would be addressed at the design stage.

"It is undesirable to create growing spaces that cannot be managed and become unsightly and unattractive," the guide says. "Consideration of the on-going management of the site is critical."

The report says roof-top gardening is already underway.

The One Brighton development in central Brighton has a rooftop allotment site, consisting of 28 mini-allotments that are rented out to residents who manage their individual plots.

Well-integrated water butts collect rain and satisfy most of residents' watering needs and each mini-allotment has its own tool box neatly built onto it. The organic waste from gardening is composted in the building's macerator which also processes kitchen waste from the apartments, and the resulting compost is then used back on the allotments. – *Alan Harman*

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Bottom ... Continued From Page 80

The mountain manager is the nicest guy imaginable. He encouraged me to place bees on the mountain in the first place. He even suggested this location. He liked the "green" image of bees on the hill, and he had some interesting marketing ideas for my ski slope honey.

He told me, "Look, this woman is on the warpath. I'm afraid she might write a letter to the paper."

I said, "Let her! The company wants to support bees and the environment! What better way to showcase this than for her to advertise it for you!"

He seemed unconvinced. "What if you moved your bees to that other place we talked about?" he said.

"Won't work!" I said. "That's only a half-mile away, and the little darlings will fly back to the old site and never find their hive."

What I thought was, "This is crazy! How did I ever get myself into this mess?"

He said, "What if I told her you can't move your bees, but next year you'll put them somewhere else?"

"Fine," was what I said, but what I thought was, "Why would I do this again? Maybe somebody else's husband's ashes are over by that other spot!"

Finally he said wearily, "I'll take care of Donna. I'll tell her the bees stay, but next year they'll be somewhere else. She'll have to accept this."

Meanwhile, I had a honey flow problem. I missed the dandelion bloom at the lower elevations due to seemingly endless negotiations over where to put my yard. As summer progressed, the bees chased dandelions ever higher up the hill. I saw one at 10,500 feet. But when the dandelions were finished, so was the nectar flow.

There was sweet clover along the highway for 40 miles, but it quit a few miles down the valley.

My honey harvest for ten hives: four supers. Half the hives would need to be fed to get through the winter.

I'd always wondered how bees would do up there. My only regret is investing so many hives in a crap shoot. Maybe next year would be different, but then again, maybe not.

Display Advertisers

I never did meet the woman who complained about my bees all Summer.

My little beeyard on the ski hill had a lot going for it: easy truck access, flat ground, and a relatively low (9,000 feet) elevation. This wasn't my first choice for an apiary, but it was available. Every other place I looked at turned out to be too close to some summer project. The lift maintenance guys might occasionally need to work at the lift terminal 50 feet from the hives, but their boss assured me, "It won't be a problem."

The downside was its 100-foot proximity to a popular hiking trail.

When I unloaded the bees, a lift maintenance man working 400 yards away at another lift terminal reported that the little darlings "swarmed" him. He also said he was "allergic." I brushed this off as mere hysteria, and I received no further reports of anyone being "swarmed."

I did wish my bees weren't quite so close to that hiking trail. I roped off an area around them with "Keep Out" signs, and the bees really weren't that obvious, unless you knew where to look. I placed 10 hives in a tight little circle, with a solar powered electric bear fence around them, and the rope fence around that.

One colony had an attitude problem. They were so testy that I gave up trying to put a pollen trap under them, and I basically left them alone, as much as possible. One day I was trying to nail the bottom board onto that hive, and they drove me right out of the beeyard.

It was late in the afternoon when hikers on the hill were few, but as I headed down I passed a 50-something Jack LaLane-type muscle guy, wearing nothing but shorts and shoes, and soaked in sweat. I wondered if my bad-girl bees might take a dislike to him passing so close to their home. In hindsight, I should have offered the gentleman a ride past the danger zone, but all I did was wave and keep going. I also crossed my fingers. I figured if there were a problem, I'd hear about it.

The bees were on the hill for a couple of weeks before the complaints began. The complainer – let's call her "Donna" – was well known to the company brass. She always has an issue.

The company tries to be a good neighbor and keep peace in the valley. But it's the squeaky wheel that gets the grease, and I wonder if coddling complainers only trains them to whine all the louder!

The first story I heard was that Donna's deceased husband's ashes were buried somewhere near my apiary. In a later version of the story, her husband proposed to her on this site. At any rate, it was a place she liked to visit. Unfortunately Donna is "allergic" to beestings, especially drone stings. That's what she said.

It seemed like everybody in town besides me knows Donna, so every time I bumped into a friend, I heard a new story about how awful Donna thought it was to have bees on the mountain. Most folks found her obsession amusing. She called or wrote to the mountain manager, the vice-president in charge of operations, and the president of the company.

Deep Throat always gets the inside word. He told me that this got kicked downstairs – to the mountain manager. "Take care of this," was the message.

Continued on Page 78

Ed **Colby**

The Complainer

BOTTOM BOARD