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Crocus are already popping up in some places – they are definitely a bright spot on Spring's horizon.
(photo by Paul Schulz)

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Bee Culture

THE MAGAZINE OF AMERICAN BEEKEEPING
FEBRUARY 2007 VOLUME 135 NUMBER 2

FEATURES

Take The National Bee Loss Survey being conducted by Dr. Jerry Bromenshenk, at Bee Alert, Technology. Go to www.beesurvey.com and check out the form, especially if you've experienced exceptional bee losses this Winter.

DEPARTMENTS & COLUMNS

Chickens or Queens?

The beekeeping industry is facing a number of challenges. Markets are changing, competition is fierce, increasing demand is a challenge, purity issues bedevil us, regulation, litigation, and labor issues regularly demand our attention.

Parasites, and Nutrition are two additional issues.

From 'Sun Country', p. 1, October 14, 2006 by Kris Ringwall.
"Al Kulenkamp of Shaver Poultry Breeding Farms, Ltd. detailed the plan for egg layers in his article, "Profile of the Layer of 2010". "The layer in 2010 will be substantially improved, but not dramatically different. She will be capable of laying 12-15 more eggs of better quality and consume up to 8 grams less feed per egg. With improved breeding techniques, the 2010 layer will be better able to cope with group-type environments."

Now consider deleting the word 'layer' and inserting the word 'queen', for discussion.

We know precious little about queen nutrition, even less about how efficiently a queen converts her nutrition into egg-laying production. We probably should know more about this dynamic. Research dollars are scarce.

Now consider this headline: "Poultry industry loses 30% of national flock to parasite".

If the poultry industry suffered the same level of losses the beekeeping industry now suffers from parasites, things would change. Private industry, folks from USDA, impacted Congressional chest-thumpers, and children's advocates would charge to the rescue, research dollars would flow.

Why are beekeeping issues viewed as so unique? Our issues are the same as egg-layer issues. I serve on the Foundation for the Preservation of the Honey bee. We have precious little money. Our ability to fund research to improve the honey bee is limited. If we aligned ourselves with altruistic foundations, or charitable organizations, we could be more effective. How should we proceed? Networking. It's who, not what you know.

It's time for the beekeeping industry to become proactive in seeking solutions.

We are spent, reacting to change, usually well after the genie is out of the bottle.

Our horizons must include seeking funding from non-traditional sources; this means beyond the halls of Congress, where we have too few friends, and plenty of enemies.

I know a good idea when I steal one. If you have a good funding idea I would love to hear from you.

John Miller
Newcastle, CA

Blueberry Pollination

I would like to complement Dr. Larry Connor on his article in the December issue about blueberry pollination. Eight years ago my wife and I took over my in-laws U-Pick blueberry operation. When we first took over the patch our yields were disappointingly low, which by my father-in-law's opinion was blamed on weather. After a little research I came to the conclusion that pollination and not weather was to blame. I placed two beehives next to the patch and noticed better crop yield the first year.

I now have 10 hives that are in close proximity to the patch year round and our yields have been super with large sweet berries. Last year a lady won blue ribbon grand champion at our county fair for blueberry jam, using berries that she picked from our patch. And customer numbers have been increasing every year because of the quality and abundance of berries. This has also been a boom in honey sales. People pick berries and see we also supply honey and buy honey.

Another native pollinator that visits our patch in large numbers are Mason bees. Their smaller size makes for easy access to flowers. Another observation is we have five cultivars of berries with Berkley seeming to be the most attractive to honey bees and I concur that our Earliblue seem to be the least visited. However, they are a very good yielding cultivar.

Keep up the good work. *The Inner Cover* and James Tew are usually the first things that I read when I get a copy of *Bee Culture*. I am also looking forward to reading your latest book, which I have already ordered.

Brent Bean
Sawyer, MI

***Connor's Note**: Thanks for the positive feed-back on the December issue article on blueberry pollination. How many acres of berries are in production? I am interested in your comments about mason bees. Are you doing anything to promote their nesting sites? You seem to have a natural laboratory study underway, and I hope you have more time to collect data on which species pollinate the five different varieties under different conditions.*

Bees Find Landmines, And So Much More!

Regarding the press release on our work, one beekeeper said:

"...this DARPA-funded scam has been going on for much too long. It is not ever going to be an effective tool, and ... populated areas of Iraq/Afghan. now have explosive residues on their surfaces."

I'm sorry to see these folks drawing conclusions based on false assumptions, with no specific information.

This is the same type of logic used some years ago when it was thought that there was no need for a better method to find landmines – farmers knew where they were.

As someone pointed out, if that was the case, how do you explain the 20,000+ people hurt or maimed each year by these devices – 50% of whom are children? Are the farmers committing suicide by running out into the fields and throwing themselves on mines? If you wonder about the need for better landmine

INNER COVER

Right now there's considerable noise being made about getting off the evil chemical treadmill that we and our bees are on. "Instead," say The Brethren of Better Beekeepers, "Now, we should produce our own house-cleaning, larva-killing, tough-as-nails, laugh-at-death and bite-the-legs-off-*Varroa*-just-to-watch-'em-die, Queens!"

Actually, the Brethren have always been around, you know. Decades ago these visionary beekeepers saw the wisdom of choosing better bees rather than tougher mites, and, by God, they *were* going to stay in business. But after 20+ years, almost all of those beekeepers ran out of bees before they ran out of their enthusiasm and passionate belief that they *were* right, dang it! Many became martyrs, but not all of them.

Some persevered. They got lucky or chose wisely. Some started over two, three, ten times – but they kept starting over. Finally some beekeepers out there slowly made it work. They didn't lose bees and they didn't lose queens anymore. And they didn't use pesticides, either. At all. None.

Mostly these aren't big operations – 2 -300 colonies or so. Maybe up to a thousand. It's an income. But they are at least that big, and that's important. You'll see why in a minute.

Here's a typical scenario. Tracheal mites hit and before you could think about it that second Winter you lost 65 – 70% of your colonies...maybe more. You spend a couple of years splitting and buying queens so there's not a lot of honey, or money, and every year you lose about the same. You kept buying replacement queens and packages, but not much changed. And sometimes there was a 100% year. Deep inside, that's a sad, ugly, gut-wrenching, physical pain. God, every box...gone.

But after listening to yet one more somebody at a meeting talk about how she grows queens, it suddenly hit – that blinding flash of common sense – Grow Your Own, *really* means, Grow Your Own Queens. Grow Your Own Bees. Grow Your Own Independence. Clarity – The Only Way Out, Is Through.

Queen production books, videos, classes, articles and equipment became important. The first few years on the learning curve are pretty much hit and miss. And there's lots of misses. When *Varroa* comes, it's bad again. But this time not quite as bad, and not quite as long. The procedure was in place and the skills were there, it just took some more patience.

Eventually Winter losses were down to 50%, then 40%, then back to 1980 levels – 15% or so on average, seldom more, often less. But all around you masses still died; friends withered; club members disappeared; and there's another auction on Saturday.

Meanwhile, The Brethren bit the bullet and made sure only the strongest survived, only those queens were chosen and only those drones were set free. And now "Stayin' Alive" is the theme song they're dancin' to all the way to the bee yard.

That's the future. Yes sir it is. Sustainable beekeeping, Russian bees, small cells, natural selection, or Survivor bees; call it whatever you want. It works. Absolutely.

But frankly, most of us aren't that big. There's not enough colonies to lose most and still come back strong with splits every year, nor dollars enough to sacrifice to the Package Gods every Spring to fill the holes. I'm telling ya – Kill most of my bees most years, and eventually I get the message – "Son, save your money and your time because you just ain't good enough."

The best most of us can do is replace, replace, replace. Lucky package sellers. But what most eventually do is throw in the towel. Who's lucky then?

But even if I could, even if I had the time to search and select from my meager few, how and where would those first virgins go to get the other half of their genetic armor? Where indeed? Simply, I can't produce enough good drones to deal with even a few good queens. And nearby beekeepers have...well, I don't know...do they have drones good enough for my queens? Snob-like, I think not. Why? Because their drones are from the same bees I've already got because they come from the same places and they die just the same. So why bother?

What I need, what thousands of small-scale beekeepers need is something other than generic queens, from careful selection, record keeping and from a *breeder* that thrives even though there are more *Varroa* than bees in her colony. Or maybe no *Varroa* at all. Wouldn't that be a surprise? For me, absolutely. For the Brethren, NOT having those kinds of bees would be the surprise.

Continued on Page 62

The Brethren Of Better Beekeepers

Status Of Pollinators In North America II

Almonds • Resistant Bees • Select Stocks

Pollination Fees For California Almonds

The California almond industry is contending with record high prices for rentals of honey bee colonies. Average fees jumped from $35 per colony in the late 1990s to $75 in 2005 and fees can go as high as $150 per colony. Given that the U.S. commercial honey bee population remained fairly stable (on a year-to-year basis) between 1996 and 2004 (NASS, 1999, 2004, 2005), the increased cost cannot be attributed *solely* to honey bee decline.

Three other factors are also responsible for the higher pollination fees. **First**, California almond acreage expanded more than 35 percent (from 405,000 to 550,000 acres) between 1991 and 2004, during which time *Varroa* mite infestations were widely detected. The current bearing acreage in almonds requires 1.4 million colonies for pollination during the February flowering period, and that figure constitutes more than 60 percent of the U.S. supply of commercial honey bees. **Second**, honey bee colonies have experienced significant Winter mortality that is attributable to *Varroa* mite infestation that leads to seasonal colony shortages each February because beekeepers have not had time to rejuvenate colonies. **Third**, the price of honey as been relatively high since 2002. Almond nectar is bitter, so beekeepers who market honey avoid almonds as forage plants. Indeed, honey traditionally competes with pollination for the beekeeper's business: when honey prices go up, pollination rental fees climb as well.

How high can almond pollination fees go? Recent almond plantings mean that bearing acreage will continue to rise. Given that almonds are almost entirely dependent on honey bee pollination, with average yields of 1 ton per acre in 2004 and prices ranging from $1-$2 per pound, even if commercial honey bees contributed only half of the yield, ***it would be worthwhile for growers to pay $250-$500 for each of the two to 2.5 hives per acre typically recommended – well above today's highest usage.***

Resistant Honey Bee Breeding

A long-term solution to the problems of parasitic mites and honey bee pathogens is the development of resistant stocks of bees. Several traits associated with *Varroa* mite resistance are heritable (that is, available for selection). Similarly, tracheal mite resistance is a heritable trait. A *Varroa*-resistant stock of honey bees was developed at the U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) honey bee research laboratory in Baton Rouge, Louisiana, and is available commercially as SMR (suppressing mite reproduction) or SMART stock.

Related efforts also have focused on identifying honey bee populations with a long history of exposure to *V. destructor* as a potential source of resistant stock. ARS began to import bees from the Primorsky region in far-eastern Russia beginning in the early 1990s. The Russian bees were quarantined on an island off the coast of Louisiana, and they have been subject to further selection. The Russian bees exhibit a high degree of *Varroa* mite resistance, and they are now available commercially.

Of particular importance is the lack of locally adapted stocks. Typically, although not universally, southern queen producers use stocks that perform well in the warmer south but that might not do well in the north, where Winters are more severe. This is especially problematic for stocks that are affected by tracheal mites or diseases such as chalkbrood, both of which affect bees more in the cooler, damper regions of the north. Establishing locally adapted populations of bees is difficult because more than 500,000 queens are shipped each year throughout the U.S. from southern production sites.

Development and Maintenance of Selected Stocks: Controlled Mating

The development and maintenance of selected stocks and breeder queens require controlled mating, generally through instrumental insemination. Breeder queens (selected queens inseminated with semen from selected drones) are transferred or sold to commercial queen producers who use them to produce large numbers of production queens for sale to beekeepers. The parentage of the production queens is controlled through the use of breeder queens. Before a *production* queen is sold to a beekeeper, it is first mated to several drones, and the mating of production queens is invariably natural. Because commercial queen producers cannot completely control the sources of the drones that mate with their production queens, the queens often mate with drones from unselected stocks of local wild bees or from colonies belonging to other beekeepers. Thus, production queens will often produce hybrid workers that *do not exhibit the desired traits or that do not exhibit those traits to the desired extent*, depending on the genetic basis of the variation under selection (for example, dominance, additive, epistasis).

The percentage of matings that must occur with a specific desired stock to ensure a mite or pathogen resistance in a colony is not known and could depend on the trait. Some work suggests that open-mated queens from selected stocks can produce colonies with useful – but incomplete – mite resistance, but another report suggests that *both male and female parents should be from selected stock.*

Although instrumental insemination is currently complicated for use in commercial queen production, there are other options for controlling commercial mating – drone saturation and isolation. The former achieves varying degrees of controlled natural mating by stocking mating areas with large numbers of drone source colonies from the desired selected source. The latter uses isolated mating yards to control mating. The opportunity to employ isolation is limited because a separation of several kilometers from other sources of drones is required.

Transition to Resistant Stocks

Converting the current U.S. honey bee population to one that is resistant to parasites and pathogens is an enormous challenge that would require unprecedented cooperation among queen producers and consumers, federal and university research facilities and extension programs, and, most important, beekeepers. A successful transition would require improved identification methods, including the use of genetic markers in mass screening for desirable traits; new stocks that are viable in several regions; an industry infrastructure that maintains superior stocks; and a *mechanism for third-party certification of new product lines.* Certification of breeder stock, mating technology, production methods and facilities, and commercially produced bees and queens would be necessary.

Perhaps even more important than developing new treatments for bee diseases and parasites is reinforcement of **regulations aimed at prevention**. Protection of North America against invasive pests and diseases from abroad is the cornerstone of pollinator protection on the continent, but existing regulations should be strictly enforced and *strengthened* to remain effective. The Federal Honey Bee Act of 1922 "prohibits the entry of honey bees from countries where diseases and parasites harmful to honey bees are known to exist." The act authorizes APHIS to regulate importation of honey bees in the United States. In 2004, APHIS changed the regulation to allow honey bee packages from Australia and New Zealand to be imported to pollinate California almond groves.

Although honey bee colonies from Australia and New Zealand can offer a short-term benefit in the pollination marketplace, great care must be exercised to ensure that they do not carry new pests, parasites, pathogens, and predators. APHIS and corresponding agencies in Canada and Mexico should conduct periodic, coordinated monitoring of honey bee populations to determine whether specific pests are present. Target species for monitoring should include *Tropilaelaps clareae* (parasitic mite), *Hyplostoma fuligineus* (large hive beetle), *Varroa* spp. And *V. destructor* haplotypes that are not present in North America, *Apis mellifera scutellata* (African honey bee), *Apis mellifera capensis* (another potentially invasive subspecies of honey bee from South Africa), and other *Apis* species. APHIS could coordinate the efforts with cognate agencies in Mexico and Canada. State departments of agriculture should be included in the development of monitoring programs and could provide valuable personnel. Shipments of bees from countries or territories that have pests that are not already present throughout North America should not be permitted if long-term safeguarding of North American pollination capacity is a priority.

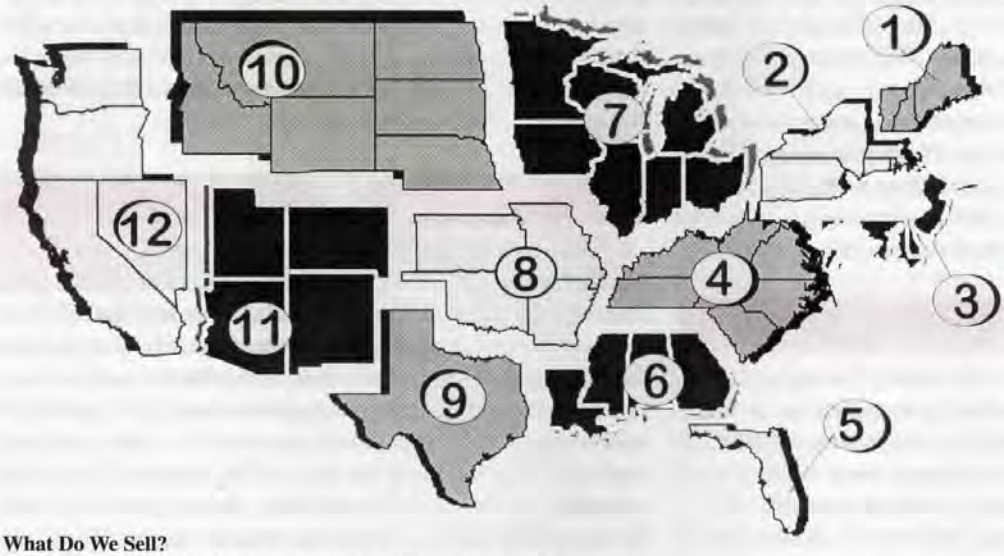
Funding

Faced with managing the *Varroa* mite threat to the North American honey bee population, the beekeeping industry might find that its funds alone are insufficient to cover immediate research needs. Special, limited-term federal support should be made available through a competitive research program targeted at honey bee genetics and management to protect populations. The program could be administered by the USDA National Research Initiative Competitive Grants Program or by the National Science Foundation. Given the targeted agricultural nature of the problem, however, a USDA program would be more suitable. Long-term, programmatic research support should continue through ARS.

The effects of increased research for improved *Varroa* mite management will be emasculated in the absence of effective communication with the honey bee industry. The recent reductions in federal funding for state extension programs leave two avenues for improving communication. **First**, state land grant universities should seek ways to cooperatively finance positions for honey bee extension specialists, who could then increase the benefits of research through education and outreach. **Second**, the honey bee industry, represented by the **American Beekeepers Federation and the American Honey Producers Association**, should continue and intensify their efforts to communicate advances in honey bee hygiene and management information. The industry also could collaborate with researchers to help identify obstacles to the transition to IPM-based beekeeping, with resistant stock as a foundation. BC

You can obtain the complete prepublication 396-page book The Status Of Pollinators In North America *from National Academies Press at www.NAP.edu, or download it for free at the same location*

FEBRUARY – REGIONAL HONEY PRICE REPORT



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We try to keep track of what our reporters sell every two or three years, to see if there are any new trends, new products, old products dropping off the radar, and any significant regional differences. We'll keep this up, every now and then, to let you know what we find, and perhaps you can take advantage of the information. For all reporters.

Percentage of our reporters that sell

1. Beeswax Candles – 37%
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3. Beeswax Blocks – 70%
4. Honey Stix – 37%
5. Pollen – 31%
6. Propolis – 22%
7. Beekeeping Supplies – 22%
8. Package Bees – 10%
9. Queens – 27%
10. Bulk Beeswax – 58%
11. Creams/Lotions – 16%
12. Beeswax Soap – 13%
13. Cremed Honey – 33%
14. Liquid Honey – 99%
15. Comb Honey – 67%
16. Chunk Honey – 48%
17. Nuc Hives – 34%

Region	Most Common	Least Common
1.	Wax Blocks, Liquid Honey	Soap, Pkgs., Stix, Pollen, Supplies
2.	Wax Blocks, Liquid Honey	Packages, Soap, Lotions
3.	All Beeswax Products, Liq. Honey	Creams/Lotions
4.	Comb Honey, Liquid Honey	Soap
5.	Wax Blocks, Wax Bulk	Comb, Chunk Honey
6.	Liquid Honey	Supplies, Cremed Honey
7.	Wax Blocks, Liquid Honey	Ornaments
8.	Bulk Wax, Liquid Honey	Ornaments, Packages, Cremed
9.	Bulk Wax, Liquid Honey	Candles, Ornaments, Packages
10.	Liquid Honey	Supplies, Packages, Chunk
11.	Liquid Honey	Propolis, Packages, Lotions, Soap
12.	Liquid Honey	Bees of Any Kind

	REPORTING REGIONS												SUMMARY		History	
	1	2	3	4	5	6	7	8	9	10	11	12	Range	Avg.	Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS																
55 Gal. Drum, Light	1.06	1.20	1.06	1.10	0.82	1.07	0.98	1.06	0.89	0.93	1.08	1.15	0.82-1.20	1.03	1.06	1.05
55 Gal. Drum, Ambr	0.95	1.10	0.95	1.04	0.84	0.90	0.91	0.95	0.71	0.85	1.25	1.15	0.71-1.25	0.97	1.00	0.90
60# Light (retail)	105.00	109.00	105.00	99.00	110.00	107.50	100.75	105.00	120.00	112.73	100.00	125.00	99.00-125.00	108.25	118.85	104.63
60# Amber (retail)	105.00	102.00	102.50	90.00	110.00	97.50	98.17	102.50	100.00	109.00	96.00	120.50	90.00-120.50	102.76	117.28	100.41
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS																
1/2# 24/case	44.64	46.65	40.80	40.30	48.58	32.50	39.07	48.58	48.58	35.76	49.00	36.00	32.50-49.00	42.54	45.36	41.29
1# 24/case	61.44	64.46	62.40	60.03	63.00	57.00	60.66	60.90	54.25	77.56	70.00	83.12	54.25-83.12	64.57	67.33	63.03
2# 12/case	61.68	55.32	60.60	56.47	62.10	51.50	56.51	66.00	45.20	57.84	55.00	63.25	45.20-66.00	57.62	58.71	56.06
12.oz. Plas. 24/cs	57.12	55.26	45.60	56.88	46.00	52.00	50.47	53.40	40.44	47.64	58.80	52.00	40.44-58.80	51.30	52.82	54.86
5# 6/case	69.62	61.79	70.50	56.93	67.22	60.00	61.39	50.00	55.50	56.43	56.00	60.15	50.00-70.50	60.46	62.71	59.46
Quarts 12/case	96.68	120.18	96.68	82.30	78.00	72.67	74.02	76.00	96.68	110.00	83.40	110.00	72.67-120.18	91.38	89.17	85.12
Pints 12/case	57.17	60.98	57.17	56.25	58.00	43.00	47.60	45.00	37.80	49.50	44.00	57.33	37.80-60.98	51.15	47.50	52.45
RETAIL SHELF PRICES																
1/2#	2.63	2.45	2.50	3.02	3.08	2.45	2.36	2.14	3.08	2.46	2.34	3.50	2.14-3.50	2.67	2.58	2.35
12 oz. Plastic	3.33	3.17	2.80	3.49	3.40	3.23	3.01	3.73	3.06	3.11	2.94	3.75	2.80-3.75	3.25	3.29	3.22
1# Glass/Plastic	4.56	3.99	3.70	4.40	3.75	3.73	3.61	4.06	3.93	3.90	3.88	4.20	3.61-4.56	3.97	4.02	3.80
2# Glass/Plastic	7.00	6.24	7.30	6.33	6.49	6.25	6.14	8.50	6.62	6.78	6.09	8.50	6.09-8.50	6.85	6.87	6.53
Pint	6.12	7.23	6.12	5.89	5.69	4.94	5.68	5.37	5.33	6.29	4.65	7.32	4.65-7.32	5.89	5.95	5.75
Quart	12.00	10.98	11.35	8.70	7.95	8.50	8.21	9.31	9.00	10.18	8.95	12.46	7.95-12.46	9.80	10.01	9.35
5# Glass/Plastic	15.75	13.20	17.65	13.29	15.00	13.59	13.50	16.00	15.06	12.52	12.16	17.59	12.16-17.65	14.61	14.77	13.45
1# Cream	4.58	5.58	5.19	4.86	5.72	4.50	4.96	4.73	5.72	4.83	4.35	6.10	4.35-6.10	5.09	4.92	4.80
1# Cut Comb	5.00	5.22	5.19	5.23	7.17	5.75	5.49	4.66	7.17	5.99	6.50	8.33	4.66-8.33	5.98	5.52	6.00
Ross Round	3.00	3.98	3.15	5.00	5.26	5.26	5.00	6.00	5.26	5.26	4.00	5.75	3.00-6.00	4.74	5.08	4.77
Wholesale Wax (Lt)	2.67	2.09	1.93	2.38	1.90	2.12	2.25	2.67	1.95	2.52	1.43	1.88	1.43-2.67	2.15	2.11	2.09
Wholesale Wax (Dk)	2.00	1.80	1.95	2.09	1.70	1.75	1.69	1.50	1.70	1.42	1.75	1.25	1.25-2.09	1.72	2.00	1.79
Pollination Fee/Col.	60.00	76.67	70.00	38.60	42.00	40.00	46.14	60.00	80.11	120.00	25.00	83.33	25.00-120.00	61.82	61.19	55.67

RESEARCH REVIEWED

The Latest In Honey Bee Research

Steve Sheppard

". . . the role of 'survivor' honey bee colonies and the fate of isolated populations was re-examined with a new twist: the population was intentionally initiated with honey bees of genetically diverse backgrounds and the experiment took place in a northern climate."

While there have been a number of studies of the interaction between honey bees and the parasitic mite *Varroa destructor*, few have actually tracked the fate of an isolated population of infested honey bees over the long term. Exceptions include several studies of an Italian strain of honey bees surviving untreated in the presence of mites since 1984 on the Brazilian island of Fernando de Noronha. Over time, this isolated honey bee population became increasingly tolerant of the mites or the mites became increasingly less virulent to the bees (or both), with the consequence that mite densities found in colonies on Fernando de Noronha have declined over the period since the initial infestation. Similar instances of mite-tolerant bee populations have been reported from a few other locales, usually in places where bees and mites occurred together and natural selection was able to act on the populations of bees and mites without the added variable of miticides. Apparently, in the absence of chemical mite suppression, highly susceptible honey bee colonies were rapidly lost to mites, while colonies exhibiting higher tolerance to mites survived and reproduced to a greater extent.

In a recent paper, the role of "survivor" honey bee colonies and the fate of isolated populations was re-examined with a new twist: the population was intentionally initiated with honey bees of genetically diverse backgrounds and the experiment took place in a northern climate (Fries et al, 2006). The starting population was composed of a mixture of European honey bee subspecies (*Apis mellifera mellifera*, *A. m. carnica*, *A. m. ligustica*) and a commercial hybrid strain (Buckfast) and the experimental location was the Swedish island of Gotland. The experiment began with 150 two-story hives that were placed in isolation on Gotland in 1999. Each colony was inoculated with 36-89 *V. destructor*. No mite control treatments were applied throughout the seven years of the experiment and colonies were allowed to swarm "at will." The only management was periodic inspection for data collection and the feeding of a sugar solution for winter when necessary. No management was made to strengthen colonies or to replace failing queens. Colonies were inspected regularly to monitor swarming activity and sampled to determine mite levels. Collected swarms were returned to the experiment in the year following the swarming event. Data were collected on swarming rate, mite load, bee population size and Winter mortality.

The mortality rate of the colonies reached a peak during the third year, when more than 80% of the colonies died. However, in years four and five, the mortality rates were not significantly different than the first Winter when mite infestation levels were low. Swarming rates showed the opposite tendency, with no swarming in year three, but increasing significantly in the last two years of the study. Likewise, the mean infestation level (mites/100 bees) was significantly lower (by about 50%) in the Fall measurements taken during the last two years (years six and seven) than the levels recorded during years two to four of the experiment. The authors found a significant "negative correlation" between the mite infestation rate in the Fall and the size of the bee population the following Spring. That is – high mite levels in the Fall translated to low bee populations in the Spring.

The researchers report that their study provides the first data from Europe where "...it is demonstrated that honey bee colonies infested by *V. destructor* may survive for over six years even if mite control is not practiced." They conclude that the study demonstrates that "some form of adaptation has occurred in the system, ensuring the survival of both the host and parasite." They reiterate three main changes that took place in the population over the years of the experiment to support this conclusion: 1) "the proportion of colonies that died over Winter de-

creased significantly" 2) "the swarming incidence increased" and 3) "the mite infestation rate of adult bees in the Fall decreased significantly." The authors interpreted the results to show that the "problems facing the apicultural industry with mite infestations probably is linked to the apicultural system, where beekeepers remove the selective pressure induced from parasitism by removing mites through control efforts." They go on to suggest that further investigation will be needed to clarify whether the adaptation they found involved increased mite tolerance by the bees or deceased virulence by the mites or both.

As the experiment was designed, the authors made no attempts to increase colonies to make up for colony losses from the initial starting population, so the number of colonies at the end of the seven years was low (13). However, the significant increase in colony survival and swarming rates (the latter is probably an indirect indicator of improved colony health) that occurred in the population throughout the experiment, provides an indication that colony divisions and increases could be made from these later stocks to reconstitute a larger population.

In the case of managed commercial production colonies in the U.S. (those bees being used for pollination or honey production), it is clear that the level of losses reported for untreated colonies in this study (80% in year three), would preclude any realistic consideration of using such a "survival" strategy to modify existing populations. However, such losses could be handled more readily in the selection portion of bee breeding programs, where the breeding stock itself was continually tested without the intervention of miticides (or, for that matter, antibiotics). Given the substantial number of large-scale queen producers in this country and the fact that hundreds of thousands of queens are widely distributed by mail and truck each year, any significant improvement in mite tolerance that was incorporated into our bee breeding populations would be amplified through dispersal to the larger population of managed production honey bees. BC

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Fries, I., A. Imdorf and P. Rosenkranz. 2006. *Survival of mite infested* (Varroa destructor) *honey bee* (Apis mellifera) *colonies in a Nordic climate.* Apidologie, 37: 564-570.

Malcolm T. Sanford

A New Nosema

"The symptoms are similar to other conditions described as 'Autumn collapse,' 'Spring dwindling,' disappearing trick' (Australia), 'mal de mayo' in some Spanish-speaking countries, and 'May disease' in France."

In the September-October 2005 issue of *Vida Apícola*, it is reported that beekeepers in Spain currently have been suffering a bout of disappearing disease (syndrome de despoblamiento de las colmenas). This means that for some unaccountable reason populations in beehives have been decreasing, but few symptoms exist other than the worker population simply has "disappeared." The phenomenon is nothing new. It has occurred around the world, including the U.S., according to Dr. Hachiro Shimanuki, now retired from the USDA Agricultural Research Service (ARS) and is, "... a classic example of a misnomer. In the first place the bees disappear, not the disease, and in my opinion, the term is used as an umbrella for what may well be many maladies."[1] Indeed subsequent extensive research has failed to isolate any disease organism in stocks that exhibited the condition. The symptoms are similar to other conditions described as "Autumn collapse," "Spring dwindling," "disappearing trick" (Australia), "mal de mayo" in some Spanish-speaking countries, and "May disease" in France.

The Spanish authors of the *Vida Apícola* article also report that several additional causal possibilities for large-scale losses exist, including pesticide-treated sunflower seeds. However, another possibility is being closely scrutinized, correlation with detection of *Nosema ceranae*. The name gives it away; the origin is *Apis cerana*, the same species that is the source of *Varroa destructor*. Thus, what the beekeepers of the world do not need, but has indeed been detected in Spain for the first time is a new kind of nosema disease. I say "new" because the symptoms appear to be different than for the traditional *Nosema apis* that is present in most, perhaps all, colonies of *Apis mellifera* worldwide. A summary of the 1995 article in *Vida Apícola* is also found on the World Wide Web.[2] The authors conclude:

- We are facing the first detection of the microsporidian *Nosema ceranae* parasitizing *Apis mellifera* in Europe. The phenomenon has also been seen in other geographic areas.
- This nosema **could be** (coorelation does not necessarily mean causality) the fundamental cause of the reported reduction of honey bee populations in Spain.
- *Nosema ceranae* has a pathology that is different from *Nosema apis*.
- Indications are that in affected areas re-infection is frequent every two to four months.
- At the present time, the most effective control of *Nosema ceranae* is a combination of disinfection of equipment with heat and/or acetic acid, as well as the antiobiotic fumagillin as recommended for *Nosema apis*.

The November 2006 edition of *The Beekeepers Quarterly*[3] takes up the story with a report by Dr. Robert Paxton, School of Biological Sciences, Queen's University, Belfast, Northern Ireland, entitled "*Nosema ceranae* Spreads Rapidly Around the World." An article currently under review for the *Journal of Invertebrate Pathology* will show that it is far more widespread than originally thought, and may be present in western honey bees across the New World, Europe and Asia.

A short history of the detection of this phenomenon is provided by Dr. Paxton. In 1995, Dr. Ingemar Fries of the Swedish Agricultural University visited China, where he described a new microsporidian, *Nosema ceranae*, in indigenous *Apis cerana*.[4] The molecular sequence of *Nosema ceranae* has been published by the National Insitutes of Health (NIH).[5] The ultrastructure and genetics were found to differ from *Nosema apis*, and Dr. Fries was able to experimentally infect *Apis mellifera* with this organism, but at the time little was made of this observation. However, in the Spring of 2005 Vietnamese researchers found both nosema types infesting western honey bees and this was confirmed by Dr. Paxton, who was able with colleagues to develop a rapid and accurate molecular detection system to differentiate the two species.

The activity above was followed by the report from Spain in *Vida Apícola*, indicating the parasite had "moved out of Asia," and was being linked to massive colony losses. Subsequently, the organism has been found in France, Germany and Switzerland as reported at the 2nd European Apidology Conference in Prague.[6]

Dr. Paxton's group solicited samples from around the world and found that *Nosema ceranae* probably "jumped host" from *A. cerana* to *A. mellifera* in the last 10 years and has spread "remarkably rapidly." It has now been found in North and South America, the Caribbean, across Europe and Asia, but not on the islands of Ireland and New Zealand. Definitive samples are still lacking from Africa, Australia and Great Britian. The conclusion: "However, given its rate of spread and occurrence even on isolated islands of the Danish archipelago, it is quite possible that *N. ceranae* is, or will soon be, spread truly worldwide."

Dr. Paxton states that the implications for beekeeping with the western honey bee (*Apis mellifera*) are profound. He says we need to understand how virulent this organism is on its new host, and that

correlation between *N. ceranae* and colony mortality in Spain is not proof it is the culprit. Many other factors could contribute to honey bee colony population decline as noted above by Dr. Shimanuki. The organism could also have multiplied in colonies dying from other causes, and there may be a synergistic relationship between the organism and other factors leading to increased colony mortality.

Questions put to Dr. Paxton by the editor of *The Beekeepers Quarterly* reveal that both nosemas can exist in an individual bee, and in quite high numbers. He believes that his first thought that *N. ceranae* was replacing *N. apis* is not correct, but that *N. ceranae* is being reported more readily, giving the appearance it is more abundant. In addition, control at the present time is unknown, although Spanish scientists appear to have used Fumidil B® with some success.

Dr. Paxton says that although the Spanish group of scientists that published in *Vida Apícola* is looking into control measures, much more needs to be done, and now. Thus, he concludes: "I hope the relevant authorities and beekeepers take note. Forewarned is forearmed."

Perhaps beekeepers can best prepare for the coming of a new nosema by reviewing what they know about the more common species, *Nosema apis*. Wikipedia.org has plenty of information on this organism, including sites linked to the Universities of Georgia and Florida.[7]

From the University of Georgia site:[8] "Nosema is caused by the microsporidian *Nosema apis*, a small, unicellular organism that is unique to honey bees; it is the most widespread of the adult honey bee diseases. Nosema infects the epithelial cells of the honey bee ventriculus thereby causing dysentery. Queens, drones and workers are all susceptible to Nosema. The spore from the parasite must be ingested by the bee in order for infection to occur. The spore germinates in the midgut, penetrating the cell lining as it multiplies, reducing the life span of the honey bee. Nosema spores are spread to other colony members through fecal matter. Colonies in northern climates are more seriously affected than colonies in the south because of the increased amount of time bees are confined in the hive. Nosema, if left untreated, can cause queen supersedure, Winter kills, reduced honey yields and dwindling populations. It is more common during times of confinement like Winter and Spring.

"The symptoms include: slow Spring build-up (best indicator) disjointed wings, distended bloated abdomen, a lot of yellow streaks on the outside of colony and crawling bees outside of the hive. These symptoms may also be associated with tracheal mites.

"Do not overlook this disease just because it is not common in the south. Prevention is the best way to keep your bees free of disease. Some good beekeeping practices are to avoid placing hives in low spots and to provide ample ventilation. Treat with Fumidil-B® according to the manufacturer's instructions."

And from the University of Florida:[9]

"Suggested feeding recommendations for fumagillin for nosema control are as noted on the label of the product (Ed note: check beekeeping catalogs for brand names of products containing the active ingredient fumagillin, like Fumidil-B® or Fumigilin-B®); feeding is generally preferable in the Fall of the year. Fumagillin is active only in syrup; dusting is not recommended. Because nosema is more virulent in confined bee populations, it generally is considered much more of a problem in temperate areas.

Recommendations by the Minnesota State Inspection Service in 1980 as published in the *Minnesota Beekeepers Magazine*, Vol. 34, No. 3 suggest the following feeding schedule.

1. Feed every two or three years if a colony averages 0.11 to 1.0 million spores per bee; this level may result in decreased honey production.

2. Feed once every two or three years if a colony averages 1.1 to 5.0 million spores per bee; this level may result in reduced honey yield and increased Spring and Winter loss as well as queen supersedure.

3. Feed two years in succession if a colony averages 5.1 to 10.0 million spores per bee.

4. Feed every year if a colony averages in excess of 10.0 million spores per bee.

"Florida research over the years indicates a general infestation of two million spores per bee with maximum seen of 36 million per bee. Feeding fumagillin at even the lowest level can result in substantial increases in honey production.

"Nosema infected equipment can be decontaminated by use of heat (120°F for 24 hours). The temperature must not exceed this or the combs might melt. The technique must be used on empty comb only. Fumigation with acetic acid and ethylene oxide have also been reported and recommended."

It may not be apparent to beekeepers in the United States, but over the last two decades beekeeping in Europe has developed into a dynamic, modern activity. Italy and France, where this author spent sabbaticals in the 1980s[10] and 1990s,[11] have always been leaders in apicultural affairs, but it now looks like Spain may be catching these traditional European leaders. Exposure to the influential Spanish journal *Vida Apícola* as revealed above shows some of this dynamism. In the January-February 2006 edition, the magazine's director, Ms. Silvia Cañas, writes an editorial inaugurating a new section of the publication as part of the activities of the journal's club. She provides ten reasons for becoming a member from receiving the bi-monthly magazine to free technical service. Included is free access the magazine's recently-launched digital version.[12] Some beekeeping associations and publications in the U.S. might benefit from studying this model as a way to attract readers and increase membership.

The same edition of *Vida Apícola* contains a calendar of beekeeping events across the country, including the regions of Seville, Tenerife (Canary Islands), Zaragoza, Cáceres and Córdoba. And in the March-April edition there is an extensive review of 8th Ibero-American Apicultural Congress at the 25th meeting of the beekeeping exposition at Castilla de la Mancha. For those with an interest in these events, I have published reviews of both the 5th and 6th Ibero-American congresses[13] and the 1998 Spanish meeting in Castilla de la Mancha.[14]

Editor Flottum believes that this story may be a U.S. first, for he has not seen any description of a new nosema reported in other publications.

We are led to conclude that whereas in the past it might be possible to at best delay reading, or at worst ignore (because it appears in a foreign language) what is happening elsewhere in global beekeeping, this is no longer the case. BC

Dr. Sanford is a former Extension Specialist in apiculture at the University of Florida.

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? DO YOU KNOW ?

Mites, Hormones and Drones

Clarence **Collison**
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While a beekeeper can learn a great deal about honey bees and the products of the hive by reading, attending educational meetings, field demonstrations and short courses, there are still many aspects of colony management that can only be learned by working with colonies. Unfortunately, learning from their own errors and suffering from the consequences is often one of the most effective ways of learning beekeeping skills. No two years are ever alike, so it is not possible to manage colonies by a set of fixed rules.

While the northern part of the United States is still locked into the Winter, the southern most parts of the country are gearing up for another productive season. Africanized honey bees, parasitic mites, small hive beetles, fire ants etc. continue to be a concern for many beekeepers. Please take a few minutes and answer the following questions on numerous topics to see how you are progressing in your beekeeping knowledge.

Level 1 Beekeeping

1. Modern beekeeping is based on four key inventions from the 1800s. Please name them. (4 points)
2. ____ Colonies with a natural amount of drone comb (approximately 20%) will likely produce less honey than colonies with little or no drone comb. (True or False)
3. ____ European colonies produce and maintain a larger number of drones than Africanized honey bee colonies. (True or False)
4. ____ A fully mated female *Varroa* mite stores 40-70 sperm in her spermatheca. (True or False)
5. ____ *Varroa* mites do not have eyes. (True or False)
6. Colonies of honey bees maintain there brood nest temperature at about ____ °F.
   A. 90 B. 95 C. 85 D. 100 E. 80
7. ____ A typical female *Varroa* mite mates multiple times. (True or False)
8. ____ A female *Varroa* mite can lay as many as five eggs per brood cycle. (True or False)
9. A worker honey bee pupa with purple eyes and a white body is approximately ____ days old.
   A. 12 B. 18 C. 11 D. 13 E. 15
10. ____ The mouthparts of immature *Varroa* mites are used for making feeding wounds on the host. (True or False)

Advanced Beekeeping

11. Compare the location of the fecal patch within a brood cell associated with a reproductive and nonreproductive female *Varroa* mite. (2 points)
12. Describe two ways that *Varroa* mites use the fecal patch within a brood cell. (2 points)
13. Female *Varroa* mites have two genital openings for the purpose of receiving sperm and these are located ____.
    A. Between the bases of the 2nd and 3rd legs
    B. On the posterior abdominal plate seam
    C. Between the bases of the 1st and 2nd legs
    D. Between the bases of the 3rd and 4th legs
    E. On the anterior edge of the abdominal plate
14. Female *Varroa* mites normally lay an unfertilized egg first and then fertilized eggs at ____ hour intervals.
    A. 10
    B. 30
    C. 50
    D. 60
    E. 40
15. ____ The unfertilized and fertilized eggs laid by female *Varroa* mites are normally placed in the same location within the brood cell. (True or False)
16. Honey bees produce invertase and glucose oxidase in their _____ .
    A. Mandibular glands
    B. Salivary glands
    C. Koshevnikov gland
    D. Nassanoff gland
    E. Hypopharyngeal gland

A small proportion of glucose in honey is attacked by the enzyme glucose oxidase to produce chemical products that impact the acidic and antimicrobial properties of honey. Please answer the following questions in regards to the two chemical reactions involved in the glucose oxidase system.

17. Glucose oxidase + glucose produces gluconolactone + _____.
18. Gluconolactone + water produces _____ .
19. ____ 10-hydroxy-2-decenoic acid is the primary component of the mandibular glands of worker honey bees and is called "worker substance." (True or False)
20. ____ *Laying workers produce a higher 9-ODA (9-oxo-2- decenoic acid)/ 10 HDA (10-hydroxy-2-decenoic acid) ratio than normal worker honey bees. (True or False)*
21. ____ Fluvalinate resistance levels in *Varroa* mites are expected to remain high over time, even if the mites are not exposed to the miticide during that time period. (True or False)

ANSWERS ON NEXT PAGE

?Do You Know? Answers

1. Movable Frame Hive
   Bellows Bee Smoker
   Honey Extractor
   Comb Foundation
2. **True** Colonies with a natural amount of drone comb typically produce less honey than colonies with little or no drone comb. Research has shown that the annual cost to a colony of rearing and maintaining a population of drones is some 35-45 pounds of honey.
3. **False** Africanized honey bee colonies produce and maintain a larger number of drones than European honey bee colonies.
4. **True** A fully-mated female *Varroa* mite stores 40-70 sperm within her spermatheca. She will use the stored sperm to produce eggs after she enters a brood cell in a future reproductive cycle.
5. **True** *Varroa* mites do not have eyes, so they depend on touch and smell to navigate through their environment.
6. B) 95
7. **True** An adult *Varroa* male mates with a female shortly after she becomes an adult. He uses specialized mouthparts to transfer sperm from the genital opening on his ventral surface to one of the two genital openings of the female. A typical female mates many times, but only a few sperm are transferred with each mating.
8. **True** Evidence suggests that either the first blood meals or chemicals from the bee (larva or prepupa) stimulate *Varroa* mites to produce and lay eggs. A mite produces as many as five eggs, but she cannot lay all five at once. She lays her first egg, which is usually male, about 60 hours after attendant bees seal the brood cell. The mite lays each subsequent egg (females) at 30 hour intervals. The typical mite will stop laying eggs on or before the 15th day.
9. E) 15
10. **False** The mouthparts of immature mites are too short and soft to puncture the cuticle of the host, so they suck blood from the wounds established by the foundress female mite.
11. A nonreproductive female *Varroa* mite places her fecal patch on the bee rather than on the cell wall where the reproductive mite places her patch. Sometimes nonreproductive mites place several small fecal patches on the bee.
12. Mite excreta (fecal patch) attracts immature *Varroa* mites which helps them find the feeding site. The fecal patch also attracts newly-molted adult mites of both sexes and mating occurs on or near the feces.
13. D) Between the bases of the 3rd and 4th legs
14. B) 30
15. **False** Female *Varroa* mites lay the unfertilized (male) egg on the cell wall near the head of the prepupa. She then lays each subsequent fertilized (female) egg on the cell wall near the abdomen of the host pupa.
16. E) Hypopharyngeal gland
17. Hydrogen Peroxide
18. Gluconic Acid
19. **True** The primary component of a queen's mandibular gland secretion is 9-oxo-2- decenoic acid and is often referred to as "queen substance." In workers, the primary components of the mandibular secretions consists of different, but related compounds, one of which is10-hydroxy-2-decenoic acid and is referred to as "worker substance."
20. **True** Workers that are more "queenlike," such as laying workers, produce in their mandibular glands a comparatively higher ratio of 9-ODA (9-oxo-2- decenoic acid)/ 10 HDA (10-hydroxy-2-decenoic acid) in comparison to normal workers.
21. **False** The resistance of *Varroa* mites to fluvalinate (a pyrethroid) would decline over time if the mites are not exposed to additional pyrethroid miticides. This decline in resistance is known as reversion and commonly occurs in resistant arthropods. Strains of fluvalinate resistant *Varroa* mites have shown a tenfold decline of resistance over a three year period when they were not exposed to the pyrethroid. Thus, in situations where Apistan® has failed, the miticide could still be used occasionally, following an appropriate period of non-treatment.

There were a possible 13 points in each test level this month. Check the table below to determine how well you did. If you scored less than six points, do not be discouraged. Keep reading and studying- you will do better in the future.

Number Of Points Correct
13-11 Excellent
10-8 Good
7-6 Fair

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Hive Control & Decision Making

Super Families, Super Sisters, and Luck Determine What Happens

Larry Connor

One of the most fascinating aspects of recent honey bee biological research has been the attempts to integrate the impact of the multiple drone mating with the concept of colony control and the decision making processes within the colony. Because the worker bees in a colony have one mother and many fathers, the sister workers of the hive are not identical. Instead they form various sub-families of sister workers who share a particular drone father. These are called super-sisters, and the entire colony of these different super-sisters make up the super-family that we call the bee colony.

It has been shown that individual worker bees belonging to the same sub-family are able to recognize each other and distinguish their super-sisters from their half-sisters. This has lead some researchers to test to see if there may be some effort by these super-sisters to promote their special interests and increase the reproductive fitness of their particular subfamily. However, any potential nepotism must be mediated by the evolutionary drive to insure the success of the hive, especially during hive reproduction.

One review of research reports the specialization of super-sisters (also called patrilines), in a wide range of bee behaviors: pollen gathering; nectar gathering; guarding; undertaking; nectar foraging; nest site scouting; queen rearing; oophagy (egg cannibalization), oviposition and larval care in queenless colonies; grooming behavior; plant choice for pollen collection; and foraging distance[1]. The authors then used microsatellite DNA analysis (a system that uses short "snippets" of DNA to identify genetic information) to show that there were 16 sub-families in one colony of honey bees, and that two subgroups were represented in significantly higher levels in two tasks: water collection and scenting. This suggests a genetic component to task choice.

Five queen cells of different stages of maturity in a Russian stock colony, June 2006, Durham, CT. The worker bees are paying greatest attention to the second cell on the left, where the developing queen has been producing pheromones and the worker bees have removed the wax from the pupal casing. A very narrow slit is evident at the foot of the worker bee at the tip of the cell. This is the cut the queen has made with her mandibles to free herself from the cell-prison.

One subfamily of bees with the same father (as determined by genetic testing) may provide specialized services within the colony. This reflects another advantage of the queen mating to multiple drones and the resulting drone diversity. No one subfamily is apparently able to control a particular hive behavior, but certainly influences the hive's welfare through decentralized decision making.

Because there is no central control of the bee social structure, no governmental center, decisions must be based on group decisions utilizing the different sub-families. We observe colonies make decisions about foraging, nest maintenance, comb building, and reproduction. Perhaps the strongest example of the group decision-making process at work as there is in the process of producing a new queen, which we will discuss next. We will follow that with a discussion on how colonies make decisions about the comb building process.

Queen Rearing as Influenced by Colony Decision-Making

Queen replacement occurs in the hive during the whole colony's instinctive reproductive division, the process we call swarming. Queen replacement also takes place when the queen fails to produce the normal amount of worker brood, in what we call the supersedure process, or when the queen is accidentally killed or lost, using the emergency response. Researchers[2] have reviewed the literature and divided the queen replacement process into three discrete behaviors: queen production (selection and feeding), queen emergence, and surplus queen elimination. There are also individual differences as seen

[1] Per Kryger, Ute Kryger & Robin F. A. Moritz. 2000. Genotypical Variability for the Tasks of Water Collecting and Scenting in a Honey Bee Colony. Ethology 106 (2000) 769-779

[2] Tarpy, D.R., and D.C.Gilley. 2004. Group decision making during queen production in colonies of highly eusocial bees. Apidologie 35 (2004) 207-216

This close-up view of the cell tips show where the wax has been removed from the tip of the cell, except along the line of the slit cut by the queen inside the hive. In the time it took these photos (under three minutes), the queen was able to cut the cell open and emerge. This is a strong indication that the worker bees were keeping her confined in the cell, feeding her through the slit. Note that the other queen cells have heavier wax along the line where the queen slit would be made by the queen inside. These cells contained younger queen pupae, indicating that the queen laid the eggs for these cells at different times.

The virgin queen emerges from the cell moments later. She was one of a number of virgin queens that all emerged during this hive inspection. The humans disturbing the bees apparently interfered with the worker bees ability to keep the queen confined.

in individual queens, as shown in piping behavior, when an audible 'piping' sound made by one queen serves to delay the emergence of other mature queens from their queen cells. The queen doing the "piping" has been shown to have a much higher likelihood of becoming the new queen of the hive.

Queen Rearing Decisions

Honey bees rear surprisingly few queens during the replacement process, perhaps finishing as few as three to six, but usually starting between 12-24 individuals – starting many and finishing few. This is in sharp contrast with the 5,000 to 20,000 drones produced by the average colony during one season. Swarming behavior is observed only when conditions favor the collection of pollen and nectar needed to support high brood rearing and queen cell production. New queens are started in the queen cups that are prepared for the queen to lay into; they are on a queen track even before the egg is laid, unlike supersedure and emergency queens. Sometimes the workers place royal jelly in queen cups before the queen lays into them. In fact, a queen larva receives continuous and abundant royal jelly by large numbers of nurse bee visits, and are provided an even greater amount of the rich food about 24 hours before the queen larva pupates, just prior to the time the cell is sealed with wax by the worker bees.

The total time for queen cell construction, egg laying, larval hatching and feeding is 15 to 16 days, depending upon genetic and environmental differences. This gives the different subfamilies within the hive time to decide which larvae will continue toward final queen production. If a frame of newly hatched larvae is placed into a recently de-queened and artificially broodless colony, a large number of cells will be started as emergency queen cells, perhaps as many as 200 on one frame. But as larval feeding progresses the number of queen cells dwindles. Part of this may be due to less than ideal conditions for cell development, for queen cells are very sensitive to chilling and overheating and may be rejected if they are on the perimeter of the comb where the temperature is less than optimal. Worker bees may decide to destroy a queen cell at any point during its development. This is often seen in queen rearing operations, where a careful count of the number of cells the day after the cells are sealed is larger than the number of ripe cells containing mature queens ready to emerge. Some of this cell count reduction may be a form of hygienic behavior removing diseased individuals, and some may be due to the decision making process of the bees.

There is adequate evidence to show differential treatment of certain eggs, larvae and pupae destined to become queens over those that fail to become queens. During the incubation period, worker bees vibrate certain cells. The workers "shake" queen cells for one to two seconds at approx. 16 Hz. Some cells are shaken three times as much as others, although this does not predict outcome. Instead, queen cells that are started earlier are found to be shaken more, and have higher emergence success.

In emergency queen cell production, the age of the brood used for cell production determines the fate of the queen cell; fully developed queen cells will be destroyed if they contain the wrong age brood. Thus the queen is able to monitor the developing queen and eliminate those queens that will not become vigorous queens.

Efforts to prove that super-sisters, with a level of relatedness of G=0.75, favor queens from their subfamily over half-sister queens, with a degree of relatedness of G=0.50, have failed to show that there is a clear and statistical significant bias. But if workers do not select super-sisters for queens, they may employ group decisions to improve the quality of the queen produced in the hive.

Emergence of new queens

Worker bees routinely keep fully developed queens imprisoned in their queen cells for prolonged periods of time. I witnessed a dramatic example of this when I inspected a Russian colony during peak swarm season (all colonies in the apiary had swarm cells after a very rainy buildup period, not just the Russian colonies). As the

"There is some evidence that bees will selectively confine half-sister queens over super-sister queens, one of the best examples yet of potential genetic control of the final queen."

colony owner and I opened the hive we observed many queen cells. I suggested we harvest a few cells and use them to make up increase colonies, so we carefully cut a few cells off the comb and placed them on top of the neighboring hive. As we inspected the remaining frames in the colony we noticed virgin queens running about on the combs, and soon I was rapidly stuffing queens into empty cages I carried in my beesuit pocket. Then we noticed that the queens from the cells we placed on the hive cover were emerging. The simple act of opening the hive had apparently disrupted the process the worker bees use to confine queens within their cells, and, thus prevent them from emerging.

After our momentary excitement died down I looked at the queen cells and saw that some queens had cut open the cells to emerge, but the workers had imprisoned them by adding additional wax to the slit at the tip of the cell where the queen had cut open the pupal silk and wax. It was through this narrow slit where the worker bees feed the queen inside the cell-prison. While Francis Huber first recorded this process in 1792, it remains a dramatic and exciting experience to observe. Our timing was unique in that we observed a large number of queen cells, over a dozen, of mixed ages and some with confined queens.

Why do bees keep perfectly good queens entombed in the cells? There is some evidence that the worker bees are using their collective consensus building to control the fate of these queens. The imprisoned cells that are shaken by worker bees are more likely to be the first to emerge. The workers control the timing of queen emergence by adding or reducing wax deposits on the incision at the tip of the cell (they must keep just ahead of the queen, for our hive visit must have disrupted the bees ability to control emergence). Finally, there is some evidence that bees will selectively confine half-sister queens over super-sister queens, one of the best examples yet of potential genetic control of the final queen.

Two other queens have emerged during the hive inspection. The chewing and control of the emergence process is under the control of the worker bees; the queens' instincts are to get out of the cells!

Queen elimination

Once a queen emerges from a cell, the worker bees continue to control her fate. They can favor one queen so she emerges first, allowing her to systematically sting her sisters still confined in their queen cells. Or the workers may kill the queen by arranging two queens to "duel" on the comb until one queen is dead (this is the simplistic example of queen elimination we have seen in nature films). The workers often have control over the success of the fight, keeping one queen in a "ball" of bees so she is less able to defend herself; indeed, a queen is more likely to win if related to the worker bees.

New queens usually do not leave with the primary swarm (the colony's original queen does this), but will depart with an afterswarm – this is most often the explanation for the workers keeping queens confined in their cells. Many swarms contain multiple virgin queens. This may reflect the large number of confined virgins, as well as a selective advantage of getting a new queen to the new nest successfully. Once the hive is in the new location, dead virgin queens may be found at the entrance of the hive, so the queen to queen duel happened in the new nest site.

Just how any preferential treatment of one queen over another is decided is unknown, and requires further study.

Selection Pressure

Control of the selection, release and destruction of queens is one of the most critical duties the worker bees have, if not the MOST important in terms of colony survival and selective advantage. While a colony could employ a policy of "any queen will do" the selection pressure on a colony appears to produce a significant number of queen candidates that are evaluated at several points in the production cycle and culled to eliminate those queens that are poorly produced, developmentally defective, wrong-aged, or of unacceptable genetics. The ability of a colony to survive within an environment undoubtedly places strong selective pressure on queens that must perform within this environment, and the only means for elimination is through the worker bees.

Worker and Drone Comb Construction as Influenced by Colony Decision-Making

During the active foraging season honey bee colonies are forced to decide between the need for food for the colony OR the need to build open comb for storage of incoming pollen and nectar. Either the colony builds comb for food storage (a process they cannot reverse once the comb is built), or they may utilize food coming into the hive and, because of the lack of empty comb, run the risk of losing abundant food when it becomes available. Recently Stephen Pratt[3] reviewed colony control aspects of worker and drone comb construction. He reported that in nature a new colony builds 1 m^2 of comb in one year, or a little more than 10 ft^2. A colony metabolizes about one-eighth of the honey it collects during the year to

[3] S.C. Pratt, 2004. Collective control of the timing and type of comb construction by honey bees (*Apis mellifera*). Apidologie 35 (2004) 193-205

secrete wax for comb construction. Bees must respond to hive and environmental conditions in such a manner as to optimize comb construction while preventing over- or under-production of wax comb at the cost of lost resources.

Lacking a central government, the worker bees must have some feed-back mechanism to reach a consensus of *when* it is beneficial to build comb, and in the case of worker and drone comb production knowing which *type* of comb to produce. Pratt has determined that to build comb colonies must fill two needs: "adequate nectar collection in the field, and the filling of their comb above a threshold level." The combination of *comb fullness* and *nectar intake* must align to stimulate worker bees in the hive to secrete wax and initiate comb construction.

The concept of comb fullness may remind the reader of G.M. Doolittle's recommendation to keep three full frames of honey in the colony all of the time (See Connor, *Increase Essentials*, 2006), suggesting that a certain level of fullness of the comb is required for bees to build new comb and initiate other expansive behaviors. Without a certain level of comb fullness, the colony will not build comb. Once the amount of filled comb and the incoming level of food reached the critical threshold, both comb construction and food storage will proceed.

We see this in the buildup period of the Spring when the bees are actively gathering pollen and nectar, but are not engaged in new wax building. Even if supers filled with foundation are added to the hive, the bees often delayed building new wax in these frames. During this time, if you look at the brood nest of the colony, you will find that the bees are busy filling the brood rearing areas of the hive with food reserves – pollen and nectar essential for new bee production and colony growth. The bees may be stimulated to draw out a brood comb if a frame is removed and a frame of foundation is added to the center of the brood nest. But sometimes this frame serves to divide the brood nest, as the bees are not yet ready to draw wax and build this comb.

Seasonal patterns of nectar availability show that surplus nectar is gathered only on certain days, just 14-35% of the days in the nectar season. When bees are not gathering nectar it is because the flow has curtailed, perhaps because one plant has stopped blooming and the bees are awaiting for the next plant to flower. The comb production of a hive reflects this pattern, and since there are generally several major periods of nectar availability during the season, there are corresponding periods of active comb building. When the supply of incoming nectar stops, the bees stop comb building as well; the bees have adapted their comb building to suit several periods of rich food availability during the season.

The individual bee plays an important role in this process, since returning foragers must find house bees to unload their nectar. The house bees are also involved in wax secretion, so there is a feedback mechanism at work that allows the bees to monitor incoming food and wax secretion. Then, when the supply of nectar falls, the stimulus is absent and the house bees stop producing wax.

The actual wax-building process is highly dynamic, as one bee adds wax to a cell, another bee moves to the same area and reworks the same area of comb. This process continues until the comb is built, filled and capped.

"Control of the selection, release and destruction of queens is one of the most critical duties the worker bees have, if not the MOST important in terms of colony survival and selective advantage."

This allows all the bees to know the size of the cell being produced, and ensures uniform cell construction.

Drone or worker comb?

In general, small colonies of bees are unlikely to produce drone comb – unless the queen's status supports the production of drones. Queenless colonies are more likely to produce drone and large-celled worker comb, but if queen pheromone is provided, the bees produce only worker cells. In hopelessly queenless colonies, the production of drone comb for drone production is the only genetic legacy the colony is able to pass on to the pool of reproductive bees.

In normal colonies, there is an average 17% drone comb. Since the bees do not produce this level of drone brood, this comb is used for both male bee production as well as for food storage. When colonies do not have drone comb present in their hive, they will instinctively build drone comb to balance the ratio of the two comb sizes. When there is a large amount of drone comb present, the bees automatically adjust and build more worker comb.

How do the bees know how to do this? Since the bees make direct contact with the combs, they must somehow measure the number and ratio of drone cells and worker cells. Since house bees have their heads into cells routinely, they may measure cell size in the same manner that the queen does, and this may provide them with the stimulus to produce the necessary cell size. Thus a large amount of drone comb, and even drone brood, may have a strong inhibitory effect on production of more drone comb. The bees are doing nothing more than measuring the hive environment, and adjusting it to some inherited, genetically regulated standard.

Finally, there must be some sort of comb building peer pressure – preventing one worker bee from building one drone cell in the middle of a comb of worker cells. The individual bees are undoubtedly influenced by the collaborative method of same-cell size construction on the comb, and this keeps the comb construction uniform and highly efficient. When damaged comb is placed in a hive the bees will sometimes build drone comb in the area where worker comb once existed. It is not the nature of the damaged comb that determines the type of cell that will be built there, but the integrated dynamic of the comb building bees, their evaluation of the colony's comb needs, and the ratio of comb that already exists within the hive that makes their comb building decision. BC

When not day-dreaming about selecting a patriline of bees to perform human chores (cleaning, cooking, bill paying), Larry Connor is sometimes found fussing at his website: www.wicwas.com. He is the worker bee who answers all messages to ebeebooks@aol.com. Thanks to Jim Clinton for assistance with these photos.

All The Buzzz in...

Brought to you by Bee Culture Magazine - www.beeculture.com

A special message to all my Bee Buddies...

Your Friend,
Bee B. Queen

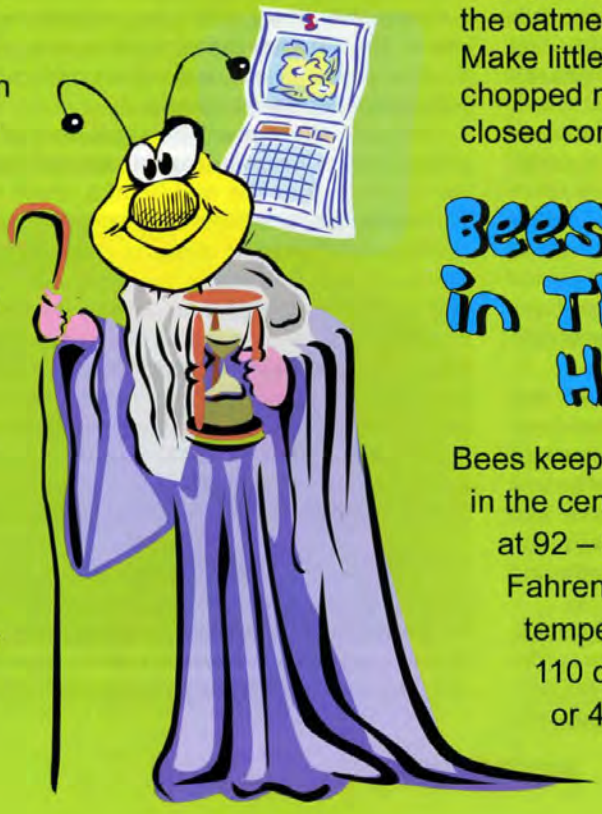
Honey Treats For Your Honey

Make this delicious candy for your family, friends or sweetheart.

2 cups mixed dried fruit (apricots, raisins, apples)
1/3 cup honey
1/3 cup quick oatmeal
1 cup chopped nuts (divided)
Finely chop the dried fruit in a food processor. Add the honey and process a little longer. Add the oatmeal and ½ cup nuts. Process again. Make little balls of the mixture and roll in chopped nuts. Place in a candy cup. Store in a closed container. Makes 24 pieces.

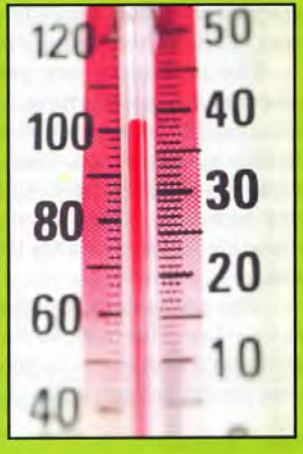
How old Can a Bee Be?

Bees live full and busy lives, but they don't live as long as people. How long a bee lives depends on the season and how much energy they use. The queen bee can live for 3 to 4 years. Worker bees only live for 4 to 6 weeks during the busy summer, and for 4 to 5 months during the winter-time. Drones can live up to 4 months or sometimes longer in the winter if there is no queen in the hive.



Bees Keep It Warm in Their House

Bees keep the temperature in the center of their hive at 92 – 93 degrees Fahrenheit even if the temperature outside is 110 degrees or 40 degrees.



Bee Kid's Corner

Produced by Kim Lehman - www.beeladyprograms com

President Puzzle

On Monday, February 19th, we celebrate Presidents' Day.
Solve the puzzle to discover two presidents who were beekeepers.

25	27	12	23	3	20	6	4	7	17	11	5	25	10	12	15
10	17	12	M	4	7	8	27	9	9	20	23	7	12	30

23 - 22 = 1 = M	19 - 12 = S	12 + 18 = N	30 - 24 = W	28 - 11 = H	15 + 5 = E	24 - 13 = I	4 + 5 = F	27 - 12 = N

26 - 23 = G	70 - 60 = T	13 + 14 = E	11 - 6 = N	17 + 8 = G	2 + 2 = A	25 - 17 = J	16 + 7 = R	24 - 12 = O

A Valentine's Day Riddle...

Q: What Valentine did the Queen Bee give to the beekeeper?
A: Bee My Sweetheart

.

Questions From Bee Buddies

Madison, from Knoxville, Tennessee asks, "How many bees are in a hive?"

Bee B. Says, "An average colony in a hive has about 40,000 to 50,000 bees. Hives have more bees in the summer than in the winter."

Send in Your Questions and Comments to:
BeeBuddies@hotmail.com

Beecome a Bee Buddy

Just send two self addressed stamped envelopes and the following information to: Bee Buddies, PO Box 2743, Austin, TX 78768. We will send you a membership card, a prize and a birthday surprise!

Name: _____

Address: _____

City, State, Zip code _____

Age: _____ Birthday: _____

E-mail (optional) _____

Raising Queens Adee Style

Every Spring Adee Honey Farms Raises Thousands Of Queens. Here's How.

Kim Flottum

Adee Honey Farms raises thousands of queens each Spring near the small town of Woodville, Mississippi. Although their system is continuously evolving, and growing, they follow the fundamentals of commercial queen production. Here are their basics.

The colonies chosen for the starter/finishers are set up in six colony units. There is one, three story starter colony and five two story finisher colonies per set. There are also about a dozen colonies set up to house the breeders.

Grafting is done in a small trailer. An external generator provides electricity for light and refrigeration.

They use the commonly available Chinese grafting tool with a flattened flexible curved scoop on the end for picking up larvae and some jelly, and a retractable-pen-like device that easily, and gently slides the larvae and jelly off the end when putting the larva in the cell. Nineteen of these plastic cells fit on a cell-holding bar, and each cell-holding frame is capable of holding three of these bars.

STARTER COLONIES

Each starter colony is set up the same way and holds four cell-holding frames. Two frames have two 19-cell bars, and two frames have three 19-cell bars for a total of 190 cells/starter colony/grafting session. There are two groups of starter colonies used in rotation, with 10 in each set up, so at each grafting session 1900 larvae are moved (19 cells/bar X 10 bars/starter colony X 10 starter colonies = 1900 cells/grafting session).

Starter colonies are rich in young bees, as are the finishers, and are reinforced or reconfigured at least once a week to maintain the young population. The starters are three stories high. Two are below a queen excluder, one of which has open brood, and the one above the excluder holds the queen cell cups.

Grafting is done five days a week – Monday, Tuesday, Wednesday, Friday and Saturday (so the crew has Sunday off) – from about 3:30 in the afternoon until 6:30 or 7:00. Completed frames of grafted cells are put in the top story of the starter colony and left for 36 hours. This is enough time to amply feed the larvae and begin drawing out the cells.

After 36 hours (for instance if cells were grafted on Monday afternoon, 36 hours later would be Wednesday morning, the bars containing cells are moved out of the starter colony into the finishing colonies.

Each starter colony has 10 bars of 19 cells each. Each finisher colony has two frames that hold these now-started bars, and each frame holds three bars.

FINISHER COLONIES

When bars are moved out of a starter colony, each individual bar is taken out of the frame in the starter colony and put into an identical frame in the finisher colony, and each goes in the same position in the frame – on the bottom row. The bar in the top row has been in the finisher long enough that the capped queen cells can be harvested, so the bar is removed and the cells harvested. This leaves the top position open so the bar in the center is moved up to the top, the bar that was on the bottom is moved to the center and the new bar is placed in the now-vacant position on the bottom. This bottom position, Richard feels, is the richest

Frame with very young larvae is selected from breeder colony.

Larvae are grafted from frame to plastic cell cups.

Larva with royal jelly in plastic cup.

Frames with cell cups and larvae are ready to put in starter colony.

After 36 hours the cells are moved from starter to finisher colony.

Each starter holds four cell-holding frames, with five bars for a total of 190 cells per starter colony.

in young bees and closest to the food in the colony, thus gets the most, and dearest attention. As cells mature they require less attention so can be a bit further from the action in the brood nest.

With the two days a week cells aren't grafted, and harvested, the time a two-day-old larvae is under manipulation is:

3 days as an egg
2 days as a larva before grafting
36 hours in the starter colony
8.5 days in the finishing colony
Total – about 15 days
(queens emerge on the 16th day)

Each finisher colony gets two bars, or 38 cells, and each bar is at the bottom of the frame, closest to warm, and nurse bees.

This is when the finisher colonies are evaluated for their ability to raise queen cells. Each is examined by the condition of the cells harvested. Some fail during the long season and are replaced or requeened. Others have other problems that need attention. This inspection also spots the fact that a queen either emerged early (and chewed the rest of the cells), or that the excluder is leaky and the regular queen moved up (and did the same thing).

Most of these problems can be prevented during the once a week brood switch, where sealed brood is moved below the excluder, and open brood moved up, surrounding the frames with the queen cells. This, Richard feels, keeps the youngest nurse bees in the vicinity of the cells. Brood frames that are moved up are placed so that sealed brood is toward the outside of the box, while eggs and unsealed brood is toward the center. Also during this inspection both finishers and starters are inspected for stores and if needed pollen is added. All this rearrangement also precludes the pressure to swarm, which increases as Spring progresses and the population builds and nectar and pollen accumulate. To accomplish this examination and reorganization of every frame of the nearly 200 colonies (starters, finishers, breeders and extras) takes two experienced people four to five hours, two days a week. Consistency in brood placement, queen evaluation and stores buildup are critical to avoid swarming and keep these colonies producing healthy queen cells. The obvious stress on these colonies is incredible.

After 8+ days the now-finished cells are harvested.

QUEEN CELLS

Harvesting queen cells is also labor intensive and requires four people. Two go through each finisher colony and remove the frames with the queen cells. From each frame the top cell bar is taken out and placed on top of the remaining frames. They then move the two remaining bars in the queen-cell-holding frame up a notch, leaving the bottom notch open (and ready to receive the next set of grafted queen cells from the starter colony). A second person moves the bars with the queen cells from the colony to the person who removes each cell from each bar, counting the good ones, and discarding the unacceptable cells as he moves along. The whole process takes a little less than an hour. The cells are removed in a heated pickup cab if the weather is cool, and placed in a large pan covered with a warm towel. This has proved more than adequate for the short time they are exposed to the outside world before they are placed in a new colony.

MAKING SPLITS

Now, for the real work. The goal is to divide the colonies that just returned so they are all nearly equal in strength. They are generally in good shape when returning from

Cells are removed from the bar and kept covered with a warm towel in a heated truck.

California, loaded with almond pollen and nectar or honey. Since the bees were treated for mites, fed protein and HFCS before moving into the almonds they usually don't need any nutritional attention. Moreover, it is Spring in Mississippi and there are nectar and pollen sources available. Feeding is not an issue. On arrival colonies are immediately given an entrance reducer.

The actual process sounds simple enough. Each colony comes to Mississippi as a two-deep unit. The goal is to divide each unit's parts – brood (open and sealed), bees and stores into at least two, or better three, and maybe even four units. The average is a little over two. The standard 'split' is one frame of open brood, one frame of sealed brood, one, maybe two frames of bees and one frame of honey plus the remaining frames empty (usually drawn, but sometimes foundation). During all this the queen is found, and killed (about 75-80% are found and killed in the time allotted for each colony).

Of course it's not as simple as it sounds. There are four colonies on a pallet, and very often all four are open, sometimes even more, to get just the right mix for all the splits that will eventually come from these larger units. With an eight man crew all doing this at once, working on over 400 colonies per semi load, and with maybe 50 or so hives all open at once, all being disturbed at once, and with the remaining hives either having just been worked or getting their bearings after having been unloaded, foraging or making orientation flights, the chaos is unimaginable. That eight man crew can manage between 320 and 350 California colonies in an eight hour day, by the way, which comes to about 10 minutes per unit. An interesting note here. Inclement weather is favored for this activity, rather than warm, sunny conditions. This weather keeps bees at home and making these splits is actually easier because fewer bees are out foraging or flying and it is easier to determine the exact population of the colony, plus fewer get lost.

Cells are put into queenless colonies . . .

MATING QUEENS

Once the separations have been made, with brood and stores all in their respective boxes they are reassembled into two story units and left to sit overnight. This allows the bees to more or less equally divide themselves to cover the brood in each box. New units, those that were created from the original colonies are kept as singles and moved that same day to mating yards. Screen is stuck in each mouse guard entrance overnight to keep everybody at home.

The next day another eight or 10-man crew divides the two-deep nucs into singles (splitting down the middle they call it) adding tops and bottoms and they, too are moved to mating yards to be requeened.

. . . and virgin queens emerge in about a day, to mate and head the colony.

These now-queenless splits are moved to mating yards all around the county. They are left there for three to four days, queenless. They are not on pallets, but individual bottom boards. This arrangement means a lot of manual labor loading and unloading each unit, but the configuration leads to nearly no drifting, of bees, or eventually the queens on mating flights. It has proven very successful for mating.

By the third or fourth day each unit has come to the conclusion that it is queenless and begins preparations to requeen itself. That is exactly when a queen cell is added. Coordinating the exact number of colonies that need cells in each yard, with the number of cells produced each day requires exact record keeping. You can't afford to miss a yard.

Mating takes place after the queen emerges from the cell and spends a few days getting oriented. There are no other beekeepers in the area, so the drones in the area are all from Adee's colonies. Drones are fairly common in these colonies, since protein was fed in California and both pollen and nectar were in abundance in the almond orchards. Thus, drones are from last year's queens, and since breeders are chosen rather carefully, the mating is pretty well controlled. It is a system that has worked and that Adee's are comfortable with.

At the same time that these full size units are being made up, several hundred five frame nucs are also being made. These are treated like the rest, moved, given a queen cell and set in a mating yard. They will be used later.

After several days each colony is checked. Queenless units are joined with one of the five framers made earlier so it has a mated queen.

These colonies are then loaded on semis and head north for honey production. Some go to Nebraska, some of the five frame nucs are used up north or sold, but none stay in Mississippi.

Once all the colonies are moved the location is closed up, the warehouse is shutdown, the trailer moved and things settle back to normal in Woodville, Mississippi. But it gets hectic up north as trucks arrive on a schedule that allows each load to get unloaded, moved, fed, and supered for the honey flow. BC

MAKING FRAMES

The Basics of Assembly, Wiring & Using

James E. Tew

Everything changes

One way or the other, everything changes, and beekeeping is no exception – nor should it be. Change and development are indications that our industry is progressing and responding to the events of our day. For instance, basswood section comb honey equipment is very nearly gone from bee supply catalogs. Just a few years ago, entire books were available on the subject of producing comb honey in basswood boxes. But replacing the old ways are new ways of producing comb honey in various plastic containers. It's still comb honey, but just in a different container. As another example, queen-producing appliances have changed greatly. Few of us still make our own beeswax cups opting instead to use reusable plastic cups. So it should not be surprising that changes in frame and foundation styles and procedures are occurring *(and I welcome them)*. Beekeepers view these changes in different ways.

Beekeeper subgroups

For no other reason than my own use, I have begun to categorize beekeepers as being either "traditional" beekeepers or "modern" beekeepers. Of course, most of you are hybrids between the two groups. Categorizing beekeepers helps me arrange for various presentations or written publications.

Modern beekeepers

The new beekeepers of the day (modern beekeepers) correctly use the equipment and procedures of the day; hence, they use a lot of plastic in their beehives.

Traditional beekeepers

Beekeepers who have been practicing the craft for years know many of the old procedures and still readily employ them (traditional beekeepers). Interestingly, bee supply companies still provide many of the old-style appliances for this group, but give almost no information on how to use these various devices. So, if you want a transformer and an electric wire embedder, you can readily buy one, but you need to know how to use it from past experience – not from any information you get from the catalog.

Two eyelets installed in an end bar.

I suppose I am a reluctant modernist beekeeper. Clearly, a properly-assembled wooden frame that supports a sheet of wired, embedded wax foundation is a better frame than the lighter, single-piece plastic frame, and is lighter than those plastic frames that are heavy duty but don't rack. The lighter frames, when full, rack and twist causing honey to seep. Many plastic frames are frequently difficult to remove from the super with common hive tools. But, these frames require no assembly and are easy to put into box equipment. Labor shortages are a chronic problem for me, and many beekeepers. I don't miss putting frames together and installing foundation, but I can't afford to pay someone to else to do it. I have no choice but to (mostly) use plastic frames.

Wood frame types

A book could be written on the myriad types of wood frames and wax foundation. Such a book would probably sell about 10 copies. Too bad. This hypothetical book would delineate part of the evolution of our industry from our earliest time. Yet, all these frames types have several features in common.

In previous articles[1], I have discussed the confusing characteristics of various frames and the foundation required to fill these frames. For your review, I have listed these articles at the end of this piece. However, here for one more time, for the new beekeepers who have an interest in the older ways, I would like to discuss the procedures and some quirks of assembling frames and installing foundation once again.

Frame Assembly Suggestions For The New Traditional Beekeeper

The fundamentals of putting frames together are obvious, but some aspects of the task could be made clearer with a bit of discussion. Since no manufacturer, of which I am aware, still bevels opposing edges of end bars *(I suspect this was always a useless feature anyway)*, there is really no way to put a frame together wrong, so, how to put it together right becomes the challenge.

Eyelets[1]

Consider this – *Before* assembling the frame, push the eyelets into the end bar holes. Most of us assemble the frame and then put the eyelets in place. My reason for this suggestion is that the metal eyelets, whose ultimate purpose will be to keep the wires from cutting the longitudinal grain of the end bar as the wire is pulled taunt, can be laid flat on the work bench in order to put the eyelets in place. Because the frame flexes and is more cumbersome to grip if the frame is already assembled, pushing the eyelets in is more difficult.

[1] Older eyelets were made of yellow brass while most of the newer ones are now bright chrome-colored. It doesn't matter.

Support pins are cotter-key looking devices sometimes called split-rivets. They are about 1" long and are split about half way down the length of the shaft. Support pins go through the end bar holes and grasp the edge of the foundation to hold it upright. For this reason, only metal edged foundation or plastic reinforced foundation should be used with support pins. (Even then, I'm not wild about them. Foundation can still bow in the center.)

Even though it only costs about $3.00, the eyelet punch is a useful, but mostly unnecessary, tool. Mine is always lost. Use a pair of needle-nose pliers, use a 1/8" line-up punch, use a scratch awl, or make an eyelet punch from a large nail. Cut the head and point from the nail, chuck it in a drill and as the drill slowly runs, file a point on the nail shaft that will fit into an eyelet. Now folks, don't do something with that running drill that I will have to hear about later – like getting your shirtsleeve caught on the rotating nail shaft, or like having the drill fall from the work bench and stab your foot.

Truth be known, most eyelet punches – even those commercially manufactured – frequently pull the eyelet back out once it's pushed into the end bar. That's annoying because there is very little place to grab the eyelet to keep it pushed into the end bar. So consider this.... while the end bar is in the unassembled state, using the eyelet punch of your choice, get ***most*** of the eyelet into the end bar hole, remove the eyelet punch and then tap the protruding eyelet in snugly with a hammer. No way for the eyelet to be pulled out when using the hammer technique.

Nails

Historically, 1¼" nails were used to assemble frames. Two on each end of the top bar, one through the side of each end bar into the top bar, and two on each end of the bottom bar was the time-honored way of nailing a frame together. If you are honoring the old ways, that's the only way to go, otherwise, put a dollop of the newer moisture-resistant glues now available to glue the end bar to the top bar. Glue relegates the nails to nothing more than a clamping device to hold the frame together as the glue dries. So what's the ruling here, traditional beekeepers? If I use glue and a pneumatic pin driver to assemble the frame, am I too far from the old way? The glue/pin process sure makes a good joint on the frame parts.

Using whatever connectors you choose, assemble the frame. Normally, the top bar wedge is left in place for now, but occasionally one breaks out. No big deal, but keep up with it. You'll need it later.

Wayward nails or pins can be a challenge. Nailing through the top bar into the longitudinal wood grain of the end bar can make the nail or pin, depending on what you used, bend and pop out. Do whatever you have to do to correct the situation. Pull the nail back out, clip it off, or bend it over (worst choice). I suspect you will need to use your drill and a small bit to punch a pilot hole before the nail can be properly driven. If you used a pneumatic pin driver, you will have to pull the pin through. I have never been able to drive a pin backwards. The pins frequently have friction-heat activated glue on them. They really want to stay where they stop.

Frame nailing devices

Frame-nailing devices are now only found at places like estate auctions or on-line auction services. Supposedly, 10 frames could be held in place for nailing/gluing so an entire box could (theoretically) be assembled at once. In my opinion – a nailing device took too long to set up, was too inaccurate, and was clumsy to get the assembled frames released. If you see one of these gadgets going cheap, it's okay to buy one, but don't expect to make great use of it.

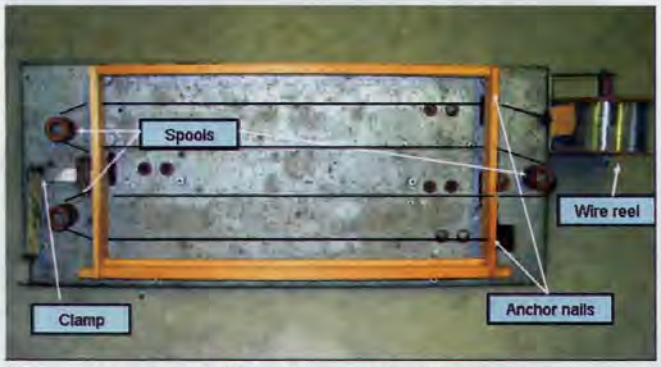
Okay, may I assume that you have assembled at least one frame by this point in the traditional frame assembly process? Next step – the dreaded wiring board.

The wiring board

What does a wiring board have in common with an eyelet punch? Both are useful but not necessary. In years past, wiring boards were elaborate devices with electrical contacts, wire spools, and stops to hold the frame in the proper position. The few wiring boards being offered today are highly simplified versions compared to the older versions (but at least you can still get something).

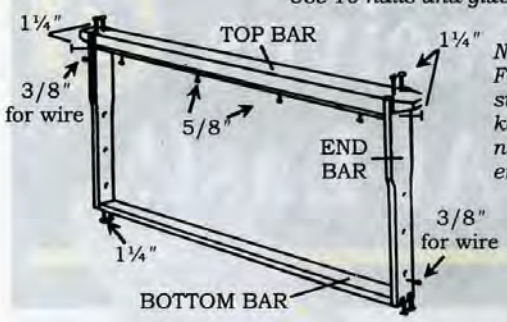
The Basic Frame-Wiring Procedure

1. On the assembled frame, already having eyelets in the end bar holes, partially drive two short nails near the upper and lower holes on the edge of the end bar. These will be the sites that you tie the wire off.

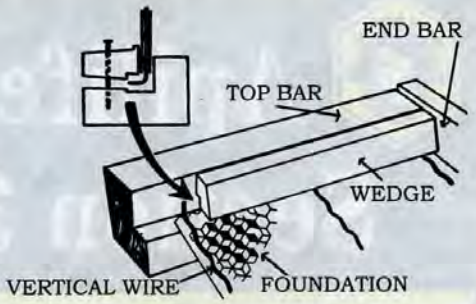


Frame wiring board. (Wire shown in black for clarity.)

An electric wire embedder melting support wires into the foundation.



Nail in all 10 nails as shown. For added strength, glue or staples may also be used. To keep top bars from pulling off, nail in two nails through the end bars into the top bar.



A close-up view of the wire hooks fitting into the top bar wedge groove.

2. If using a wiring board, install the frame on the wiring board and set holding clamp if one is present. Different wiring boards use different techniques for holding frames.
3. Depending on the location of the wire spool, begin threading the wire through either the upper or lower eyelet hole. Upon getting to the end of the run and at the hole farthest from the spool, wrap the end of the wire around the nail. Finish driving the nail flush and break off the wire remnant.
4. Work the slackness out of the threaded wire. Tweak the wire, all the while rolling the slack wire back onto the wire reel. Your right hand holds the spool while the left hand does the tweaking. The wire should be tense, but not banjo-string tight. This frame will never be a musical instrument.
5. If the wiring board has spools, slip the wire off the spools and again wind surplus wire back onto the spool. Tweak again. The spools primarily prevent kinks in the wire.
6. While holding the wire in a tense state, twist the end of the wire about three times around the nail stub nearest the wire spool. Drive the nail flush and twist the wire until it breaks off. The wire should be twang-tight but again, not excessively tight. Having three hands will help with this step.
7. If present, release the wiring board clamp and remove the wired frame from the device.

Some comments on wiring frames

1. Partially drive anchor nails on end bars ***before*** placing the frame on the wiring device. The device provides a springy surface that is not conducive for nail driving.
2. Kinks in the wire will usually result in the wire breaking when it is pulled taunt.
3. Again, it is important that the wire should only be tight enough to hold the foundation upright and in place.
4. Wire strands nearest the spool will probably be tighter than strands farthest from the spool. The wire tends to bind where it passes through the eyelets. As much as possible, correct this situation.

Installing foundation

The wood cleat should now be broken from the top bar. Any rough splinters should be trimmed with a sharp knife. Depending on the type of bottom bar, the foundation is either put through or set between the bottom bar halves while the top of the foundation sheet is dropped into the top bar slot. The sheet should fit neatly and tightly. If present, foundation hooks should be captured underneath the foundation cleat. The cleat, now holding the foundation in place, should be lightly tacked with two – three ½" nails. Though still loosely contained, the foundation sheet should look fairly flat.

Embedding wires in foundation

An embedding board is nothing more than a simple board that will fit inside the perimeter of the frame. The board provides a firm foundation for the wire embedding process.

Using either an electric wire embedder or a spur wire embedder, the horizontal wires will need to be pressed into the foundation sheet. While a bit more complex to use, the electric embedder does a better job, but the spur wire embedder is much simpler and faster to use.

Electric wire embedders are available from bee supply sources. Using a small transformer (or an electric train transformer or a battery charger), the electric wire embedder slightly heats the horizontal wire which in turn, lightly melts the wax foundation surface just beneath the wire. The wire sinks into the molten wax. Release the electrical current, but hold the embedder in place for a few seconds while the wax hardens around the wire.

The purpose of the wiring, both horizontal (provided by the beekeeper) and vertical (provided by the manufacturer) is to hold the foundation in place while the bees build comb on it and second, to provide strength to the comb during the extracting procedure.

Again, a little heat goes a long way. Too much heat will quickly melt gaping holes in the foundation sheet. Ironically, the bees will repair such holes, but they will frequently be repaired with drone comb.

The finished frame

Clearly, this is not an insignificant amount of work per frame. But when you finish and admire the new pine frame giving off a beeswax aroma – foundation flat – wires all nice and tight, you feel good about your work. As is so often the case in beekeeping, doing a few is pure enjoyment while doing a lot more is pure work. You decide where your line is. BC

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[1] For your review: Archived *Bee Culture* articles discussing frame and foundation assembly are:

1. Tew, James E. 1981, April. *Foundation and Frames.* Pp. 204, 219. Gleanings in *Bee Culture.*
2. Tew, James E. 1996, November. *Frames, Build Them Right, Build Them Fast.* Pp. 609-629. Bee Culture.
3. Tew. James E. 2005. *The Proper Foundation for the Proper Frame.* Pp. 47-49. Bee Culture.

Georgia's Bee Lab

Rich in tradition, research, and accomplishments.

Jennifer Berry

In our 21st century, fast-pace lifestyles, we tend to be unmindful about how it is our jobs came to be. Whose hard work, sweat and tears occurred previously in order to pave the way for our job to exist today? Until just recently, I, too, knew little about the history of the bee lab in which I work. So, let's take a look back over the past 38 years of the University of Georgia's Honey Bee lab.

In 1969, Dr. Alfred Dietz was hired as the state's only beekeeping research and education professor at the University of Georgia. He was fresh out of the University of Maryland were he successfully coordinated the 1967 Apimondia world congress, which, by the way, was the last time it was in the United States. Dr. Dietz quickly came to realize that just because you work for a large, land grant institution doesn't necessarily mean your lab will be financed. In fact he learned it was the opposite. He had very little financial support, so in order to survive in the land of research, he quickly become an expert at writing grants to fund his projects. While learning the ropes in grant writing he began working with electron microscopy and took the first pictures of the honey bee sensory organs and the bee louse (*Braula coeca*). Shortly afterward he returned to his roots and began delving into honey bee nutrition. While studying at the University of Minnesota he worked for Dr. M. Haydak, the famed honey bee nutritionist. His work with pollen lead to the determination that purple brood came from pollen collected from summer titi (*Cyrilla racemiflora*). He also expanded his research concerning queen storage and found that using emerged queens in mating nuclei was better than using queen cells.

Dr. Dietz, having an instructional appointment as well as a research one, began teaching a beekeeping course at UGA. His classes were not well attended at first, with only six students, so he decided to try the theatrics in order to lure more students to class. He would dress up in traditional German costume and pose as the infamous Dr. Karl von Frisch. He would then present lectures on bees around the campus. He also mentored students as well as post docs during his years of service at UGA. Two of his students became well known in the honey bee world; Dr. Jeff Pettis, researcher at Beltsville Bee Lab and Dr. Malcolm Sanford, retired entomologist at the University of Florida. His post doctorate, Dr. Frank Eischen, forged on and is now a research entomologist at the Weslaco Honey Bee Research Facility. In 1980, Dr. Dietz expanded his program by building the original bee lab at the horticulture farm in Watkinsville. That lab was the only semblance of a honey bee research facility in the state until 2000 when Dr. Delaplane received money from the state to build an additional lab. By 1983, Dr. Dietz's program was the top recipient of grant money for the entire department of Entomology at UGA, earning a total of $2 million. In 1977, Dr. Dietz became an exchange professor at Ehrlangen and in 1995 a guest professor at the University of Tubungen. But probably his greatest legacy was his work in Latin America on Africanized honey bees in the 1980s.

In January of 1990, Dr. Keith Delaplane took a position as assistant professor in the Department of Entomology at UGA. He was a recent graduate of Louisiana State University, mentored by Dr. John Harbo. His position replaced Rodney Coleman who retired as the extension apiculturalist before him. In the good ole days when money was available in the College of Agriculture, there were actually two Georgia state apiculturalists; one for extension and one for research. Rodney Coleman was Dr. Dietz's extension partner at UGA until he retired. Dr. Delaplane then filled the position as entomologist with the appointment being 100% extension. During this

Al Dietz

Malcolm Sanford

Jeff Pettis

Frank Eischen

Keith Delaplane in the Georgia Bee Lab.

The Georgia Bee Lab.

time, Dr. Dietz was a consultant on Africanized Honey Bees in Washington DC. It wasn't until 1994 that Dr. Dietz retired from UGA and gained Emeritus status from the department of Entomology. No plans were made to hire a replacement for Dr. Dietz so the lab became Dr. Deleplane's responsibility. One year later Dr. Delaplane was offered associate tenured professor, becoming a full professor in 2000.

During Dr. Delaplane's first years at UGA, he created his much watched public TV series "A Year in the Life of an Apiary". Dr. Delaplane's initial idea was for a short 30 minute beekeeping overview to be used at beekeeping and extension meetings. The idea expanded and grew until it became an eight part television show. The series follows the start up, management and maintenance of productive honey bee colonies through an entire year. He also wrote a book which accompanies the series which has recently been revised. Dr. Delaplane's name became well known almost over night due to the public TV series. To this day he believes the video project, his first inspiration at UGA, may be his best work.

Early in his career, Dr. Delaplane decided to coordinate an annual beekeeping event with Young Harris College. The Young Harris Beekeeping Institute has been an annual occurrence for 15 years and has been a huge success. It has hosted numerous speakers from all across the country and the world with attendance growing to over 100 participants over the years. The institute is held every year in May at Young Harris College in the beautiful mountainous region of north Georgia.

Jamie Ellis' Small Hive Beetle incubation chamber.

In between the extension responsibilities, writing monthly articles and extension publications and lecturing, Dr. Delaplane also found time for research. In the early 90s, he looked at controlling tracheal mites with vegetable oil and menthol. Then shortly afterwards, he and Dr. Mike Hood from Clemson University took on a three year project to determine the economic threshold for *Varroa* mites in the southeastern US. In the 1990s, very little attention had been paid to IPM in the beekeeping world. Determining the economic threshold was the first step in laying the foundation work and has become instrumental in future IPM research projects (which I'll discuss later). Dr. Delaplane felt that the beekeeping industry needed to break free of its dependence on chemicals. That is why this lab has worked for over a decade on IPM for *Varroa* mite and small hive beetle control.

Along with his research accomplishments, Dr. Delaplane is the author of numerous research and extension publications. He is author of *Honey Bees and Beekeeping: A Year in the Life of an Apiary* and Dadant's revised edition on *First Lessons in Beekeeping*, plus he co-authored with Dan Mayer on *Crop Pollination by Bees*. Along with Tom Webster, he edited *Mites of the Honey Bee* as well as several chapters in books. He is currently the senior editor for the *Journal of Apicultural Research*.

Over the past eight years, Dr. Delaplane has mentored five graduate students and one post doc and with them came research projects, lots of research projects. Here is a condensed list of those projects. His first graduate student, which was me, explored how old comb effected colony growth, brood survivorship and adult mortality. We also investigated whether top or bottom supering increased honey yields and found no differences. During that time, Selim Dedej came to UGA in 1999 as a Fulbright Scholar. His research project explored what effects hygienic queens, comb age, and colony microclimate have on chalkbrood disease. He then returned in 2000 to pursue his doctorate which focused on blueberry pollination. His work proved that when honey bees are

introduced to blueberries they increase productivity of that crop. He also investigated the interaction between honey bees and carpenter bees on blueberry pollination efficacy and the effectiveness of honey bees in delivering the biological control agent *Bacillus subtilis* to blueberry flowers in order to suppress mummy berry disease. Next on the scene was master student Nabor Hector Mendizabal Chavez from Bolivia. Nabor worked on selecting queens with reduced colony *Varroa* levels, high brood production, hygienic behavior, high honey production, and gentleness. Then the Ellis team showed up with Dr. Jamie Ellis as the bee lab's post doctorate and Amanda Ellis as a PhD student. Dr. Ellis continued his work on small hive beetles since they had become such a pest here in the south east. It was also the main topic for his doctorate work in South Africa.

He took on several ambitious projects during his two years here at UGA. One project was to determine the economic threshold of SHB's in honey bee colonies and the other one to determine if IPM methods for *Varroa* mite control are cost effective for the beekeeper. He also explored certain nematodes as biological control agents for the larval stages of SHB's.

In 2006, Amanda Ellis finished her second year of research and will join the lab once again this spring to finish her final season. Her research will attempt to quantify the secondary effects of parasites on pollination efficacy and foraging energetics of honey bees. *Varroa* mites and small hive beetles served as the model parasites, and blueberry as the study plant. She also evaluated the pheromone-based attractant Fruit-Boost™ to determine if it enhanced pollination by honey bees in seedless watermelon systems.

Finally, to round out the students we have master student Eleanor Spicer from North Carolina. Eleanor is investigating the pollinator's role in sustainable agriculture. In a nutshell, when there is a shortage of pollinators, plants begin to compete with one another. Therefore how does one reconcile for this when fewer pollinators force floral competition. Her project focused on watermelon and sunflower. From her work this summer, she showed that when plants compete for pollination, the least attractive suffers. In this case watermelon was pollinated less than the sunflowers.

Jennifer Berry.

Well there it is, 38 years at the University of Georgia bee lab. Since I have run out of room, later I'll bring the lab into the present and discuss in more detail our decade long IPM studies and queen breeding project. Till then, see ya! BC

Jennifer Berry is a Research Associate at the University Of Georgia and is past president of EAS.

WHAT ABOUT THAT BOARDMAN FEEDER?

Walt **Wright**

If you use it correctly, check it for leaks, and keep the entrance reduced, this is a safe and trouble free way to feed.

Several months ago (midsummer '06) an extensive article was prepared on the boardman feeder. My contention in that treatment was that experienced beekeepers who knocked the Boardman didn't understand the principals on which it operates. Wanting to be on firm ground before submitting the article for publication, a PhD in physics was consulted. Wayne Long of Tullahoma, TN was kind enough to review my draft and offer critique. I suspect that we both learned something from the exercise. Having spent several months on the subject, and being burned out on all the details, this submittal will shrink the treatment to a discussion of the important factors.

That should leave some space for a related subject – stimulative feeding in late winter/early spring. It is my opinion that stimulative feeding of syrup in the early season is a myth. The opinion is based mostly on observation of colony scheduling of activities, and there is no supporting data. The subject will be treated later in this submittal. You may ignore it at the risk of unwarranted time and expense.

Boardman feeders have been at the center of controversy for decades.

Boardman Feeder – Discussion

The most consistent reason given for contempt of the device is that it "incites robbing." Robbing is not automatic with its use. To cause robbing some feed needs to be exposed on the outside of the hive. Stronger colonies in the area, finding feed exposed, will be inclined to call out more foragers to take advantage of the source. The worst case scenario is when robbing gets started, and the pressure is on the colony being fed, robbers overwhelm the weak colony, and take what little stores they had on the inside. It's less a problem when field forage is available, but in a nectar dearth, robbers can be vicious. It sometimes seems that stronger colonies form a temporary alliance to attack in greater strength.

The robbing campaign all starts with some feed exposed on the outside of the hive. Care taken in use of the Boardman can prevent exposed feed from attracting the attention of other colonies. Assuring the unit performs properly before installation and some care in application will provide trouble-free use. The unit that leaks, weeps, or seeps feed onto the landing board starts the big problems. Causes of weeping will be treated below in the order of significance.

First, let's counter a popular misconception. The airspace at the top of the inverted jar is often referred to as having a "vacuum." The implication is that the vacuum is holding up the weight of the feed. Not true. To have any significant reduced pressure below atmospheric, you must have a closed system, such as a tank or vessel of some sort. The Boardman jar is not closed to atmospheric pressure by virtue of the openings in the cap. There will be atmospheric pressure, or close to it, in the airspace at the top of the inverted jar.

What actually supports the weight of the feed (head

Stimulative feeding has been a mainstay for a long time. It's a misconception.

pressure at the bottom) is surface tension across the holes in the cap. Surface tension is that property of fluids that causes a droplet to be round in free fall, or bead up on a dry surface. Surface tension has its limits. To be effective in holding back the weight of the feed, the holes in the cap must be tiny. The wider span of larger openings will cause some fluid to pass or weep. If the hole is large enough, the fluid will pour. The bottom line is that before installation, the cap perforations need to be demonstrated to be small enough. The test described below can be performed with tap water. If the cap passes the test with tap water it will do better with the feed of your choice. Any feed has more surface tension then pure water.

When the jar is inverted with perforated cap, there is a stabilization time. A full jar stabilizes almost instantly, and the nearly empty jar takes longer. That's because the trapped air volume is more elastic than the water volume and it takes longer to equalize the competing physical forces, or reach equilibrium. For this test a half jar of water is used to average the stabilization time.

Another factor that can influence results of this test is inertia. Hold the jar relatively still. Upward motion of the jar, and the inertial effect on the water, can overcome the surface tension at the holes and punch water out at the holes. With that much background you are ready to test your cap hole size.

Invert the half-filled jar at eye level. The dribbling of water should stop in a few seconds. If it doesn't, you are already in trouble. A mildly oversized hole will continue to build a bead on the cap surface until it drips, then start a new bead. A significantly oversized hole will drip continuously. Either constitutes test failure. If there are just a few offenders, they can be plugged and retest performed. Otherwise, discard, and punch smaller holes in a replacement cap.

Now that you have a cap that meets the static fluid support requirements, you are *not* ready to use it with confidence. Conditions are not static in the beeyard. Ambient temperature change can affect seepage. Warming both fluid and air causes expansion of both. The only relief from expansion is to push fluid out at the bottom – another cause for seepage.

In the frosty morning period, where night-to-day temperature rise occurs while the colony is still clustered, some accumulation of feed is possible inside the Boardman. With properly sized holes in the cap, however, the accumulation is not normally enough to spill over onto the landing board.

Expansion rate of the feed can be increased by direct sun warming of the feed itself. Sun rays pass through the transparent jar and warm the not-so-transparent feed. The accelerated expansion of direct sun warming can be offset by shading the jar. We use a lunch-bag sized paper sack on our half gallon jars.

A couple other "just in case" recommendations are offered for your consideration. Just in case your Boardman weeps after doing the best you can to avoid it, the following will tend to reduce robbing:

1. Install the feeder on the extreme outside of the landing board – nearest the cluster.
2. Install a solid entry block to a small entry opening at the far side of the landing board.
3. Elevate the side rail on the entry side with shim stock such that the entry is higher than the feeder. With the feeder on the low side where potential overflow can be expected, there is no direct trail of feed to the entry to encourage invasion by the robbers.

A hundred Boardman feeders were ordered to go "all-up" on stimulative feeding. The caps provided with the units all weeped to some extent – some worse than others. The naïve beekeeper, expecting to be sold a functional unit, thought that was normal performance. Using them in the early season, all the potential problems came into play. When we figured it out, it was resolved to someday write it up to keep others from having to endure the hardship. Someday was yesterday.

SUBJECT CHANGE

Clear the slate; we are starting over on a new subject. This topic is expected to encounter stiff resistance from the "old dogs." "Stimulative" feeding has been a literature mainstay for a long time. Taking the word stimulative at its dictionary meaning, we assume that improving colony growth rate is the objective. That assumption implies that the growth rate is accelerated by feeding the nectar substitute. The implication that the bees are misled into acting on nectar availability, and accelerate brood nest expansion is just another hand-me-down misconception from yesteryear. Keep in mind that my reservations on stimulative feeding are *restricted* to the feeding of syrup or nectar substitute. Feeding pollen or a pollen substitute is a different discussion, but in some ways relevant. Since I'm not there yet, it's difficult to predict how much of each is likely to be treated.

There are several situations where late winter feeding is beneficial. More severe colony needs could be considered mandatory feeding situations. Those situations are those that help is needed to *sustain* brood nest growth at normal rates. The well-provisioned colony does not need that help. The question being addressed here is whether or not the feeding of nectar substitute actually accelerates brood nest growth (stimulates.) Ok, so I'm a nit-picker. Let's get into it.

A little history might be appropriate. Having tried several other ways to supplement retirement income such as fertile eggs, meat rabbits, and beef cattle, three hives of bees were purchased. It was obvious that the other ventures were not the way to go. Buying feed at retail prices canceled out any potential profit. But the bees feed themselves. That's a big plus.

Spurred on by the first full season (a super year) beekeeping seemed like the way to go. In the second full year, a few swarms were collected to run the hive count up to 10 going into Winter. That 3rd Winter the tracheal mite penetrated the area and took out eight of 10. The two survivors, in essence, caused me to start over with a major obstacle to overcome.

Tracheal mite effects do the most damage over the Winter and into the early build up. It was imperative to

become familiar with the build up process. There was not enough time in my schedule to sample mite infestation levels. This meant that judgments would be made on growth rates of the colonies. Written records were not kept at that time, but scrawled outlines of brood volume on the back were maintained on each hive opening with a permanent, felt-tipped marker, and dated. As the season progressed, a record of growth rate was conspicuous before popping the top. Slow developing colonies were inspected in greater detail.

The above background material is included to alert you to the fact that I had pretty good feel for growth rates before trying stimulative feeding. A second motivation for the trial was that medication for Nosema needed investigation. The feed was used as the carrier for the medication. After two full build up seasons of across-the-board stimulative feeding the effort was discontinued. There was no evidence that build up rates were accelerated by the extra work and expense, with well provisioned colonies.

Reflecting on the causes for this disappointment, it makes sense when you understand the bees' format for build up. Collectively, the following observations provide ample reasons for the ineffectiveness of feeding syrup to stimulate growth. Be advised that these personal observations have not been blessed by anyone that I know of. Most of these observations have been mentioned before as they relate to other subjects. This list is considered those that are relevant to build up rates. This list is also oriented to "**well provisioned**" colonies - those that met requirements for dependable wintering in the Fall.

1. The colony can roughly double brood volumes in each successive worker brood cycle. The doubling accounts for the "explosion" in the swarm prep season.

2. Brood nest expansion is limited by at least two factors: The amount of honey consumed by population and brood - freeing up cells for expansion. And the population of adult bees required to maintain brood rearing temperatures. In mid Winter the second has the greater impact. In late winter, honey consumption is the controlling factor.

3. Adult bees in early build up are mostly foragers. This permits them to take better advantage of limited foraging opportunities.

4. The primary stimulation for full bore build up is pollen availability in the field. Early season foraging is predominately for pollen and water to thin honey for consumption. The colony in contact with overhead honey has little need for nectar if water is available.

5. The honey bee is greedy. They can't pass up free carbs, even if it is not in their best interest to do so. They will rob out less fortunate cousins when they have no place to store the booty.

6. In the build up period, the colony wants all cells filled within the cluster perimeter. With the exception of cells of honey being drained in the direction of expansion, filling empty cells with nectar is a high priority.

So what happens to the stimulative feed? One might suspect that individual bees are pressed into service as mini storage tankers. That's a major speculation, however. One thing we are sure of is that they are not going to throw it overboard. If the guess is actually correct, you may be doing the colony a disservice, since those bees would be taken out service for pollen foraging. That could slow expansion. The literature reports that northerly

Take a hard look at stimulative feeding for your area. It might help, but then watch for swarms.

locations sometimes have a brood break in late Winter. The colony that has used all the residual Fall pollen puts brood rearing on hold pending field pollen availability. If that is true, it would seem reasonable to feed pollen or a substitute to stimulate. Only feed syrup to fill the brood nest. That would help. An internal water source might also be an asset. Or maybe that boardman feeder could be filled with water.

If you feel cheated out of a more comprehensive discussion of my opinion, go back and digest the content of the observations. It's all there. Although this was not intended to be a test of your deductive powers, you might come to the same conclusion that stimulative feeding of syrup can be counter productive. It seems to me that excessive feeding of syrup, when the objective is honey consumption for brood nest expansion, is pushing the colony in the wrong direction.

There is, however, a circumstance where feeding could accelerate expansion. That is the case where an empty deep is reversed in late winter. The bees are not going to expand into the empty deep until nectar is stored there first. If field nectar or flying weather is delayed, expansion is delayed. Feeding at reversal would speed up the process.

The recommendation from here is to take a hard look at stimulative feeding for your area. Keeping in mind that the doubling effect of normal brood nest expansion could mislead you into thinking the feeding is helping. If you get more than double the brood volume in a worker brood cycle, only then is stimulative feeding an asset for your location.

But you are building increased swarm potential. BC

Walt Wright manages and feeds his bees near his home in Elkton, Tennessee.

Fixing (and preventing) WAX MOTH Damage

Give the bees a hand and clean up those damaged frames.

Ann Harman

For some of us it's the middle of Winter and others are thinking of Spring. Back there in a corner of the shed is that hive that suffered a major wax moth attack at the end of the season. Who knows why the colony weakened – *Varroa*, no food, lackadaisical queen – but the wax moths had a very good time before you found out what was going on.

At least the hive has sat over the Winter in an unheated shed. If you live in a climate with below freezing temperatures, even for a few days all the life stages – eggs, larvae, pupae and adults – are dead. But you'll need that equipment – for a package arriving in April a split from that big colony for swarm prevention. That hive is a mess.

Bees will clean up a wax moth mess, but think of that package, or the split. A small colony with a laying queen. Brood needs to be kept warm. Food needs to be distributed. Give those bees a break and get that equipment cleaned up.

It always amazes me at the strength of wax moth larvae as they prepare a "bed" for the cocoon. They diligently chew into the wooden parts of boxes and frames and attach their tough cocoons. You have to admire their determination.

Let's tackle the equipment and see what can be salvaged. First, clean up your hive tool. One that is sticky from honey, wax and propolis when combined with wax moth webbing and cocoons will resemble masses of bubblegum. Your hive tool needs cleaning up before the season anyway.

Usually bottom boards, inner covers and hive bodies just need a good scraping to rid them of cocoons. Structural damage is limited to unsightly scoops in the wood that will not bother the bees.

Frames, however, can present other problems. A severe attack of wax moth can leave some wood frame parts weakened from the chewed-away wood. Inspect those wood frames and those with weakened parts should be destroyed, along with the wax moth debris. You might be able to salvage a top bar and perhaps other pieces, but consider your time and effort versus the cost of some new wood frames.

Wax moth adults are about the size of an adult honey bee.

If you used wax foundation in your brood nest frames consider that comb a total loss. Wax moth larvae relish tunneling around in brood comb with its resources of pollen and bee debris. Comb that has been built on Duragilt® cannot be used after the debris is pulled and scraped off. The lightly embossed surface is not considered starter comb by the bees.

How about frames with plastic foundation or those frame-foundation combinations now offered by many equipment suppliers. Here you are in luck. To clean the plastic foundation off it is best to use your fingers to pull the webbing from the plastic. A light brushing can help also. I do not recommend scraping vigorously with a hive tool or scrubbing away with a very stiff brush. A layer of wax on the foundation is best left undamaged, to help the bees rebuild comb. Small bits and pieces of webbing will be cleaned off by the bees, even those in a small nuc or package colony.

Burn the mess, even though the eggs of wax moth are presumed to be dead. You can bury it in your compost pile but I recommend pulling the wires out of wired foundation.

You can save yourself a lot of time and bother by prevention. First you have to consider that wax moth is everywhere during the warm months. Next you have to know a few facts about the life of wax moths.

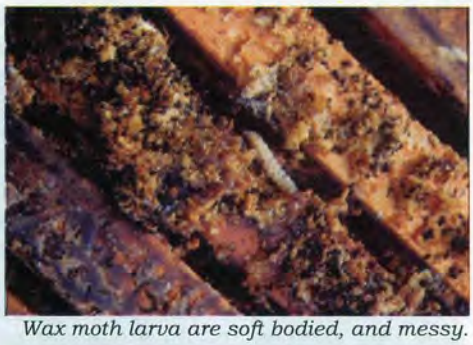
The wax moth female is sneaky and quick. She is active during the warm months so beekeepers in the south can expect wax moth damage almost any time of year. Year around your best defense is a strong colony. However, even in a strong colony one or two wax moths can lay some eggs in cracks and crevices. But the bees of a strong colony can eliminate the young larvae before damage is even noted.

Boxes of comb and empty honey supers can be stored briefly during the summer above the inner cover of a hive. The bees living below will protect these from damage – as long as the colony is strong. But if the colony should weaken those stored combs will be susceptible to damage.

You can do a number of things to prevent damage. It is still possible to obtain paradichlorobenzene (PDB). This chemical is lethal to wax moth larvae, and the odor of this chemical can be aired out of treated hive parts if they are left outside for several days before use by the

Frames can be damaged by wax moth larva chewing the wood for a space for the cocoons.

Larva webbing can be a real mess to clean up.



Wax moth larva are soft bodied, and messy.

bees. But you must consider what you are doing. PDB Is absorbed into the wax and residues are being found in wax. Do your bees need to be exposed to wax containing PDB? No. Does your honey need to be stored by the bees in wax containing residues of PDB? No.

Comb that has contained **only** honey and never any brood is not appealing to wax moth larvae. They do not survive on wax and honey. So if your honey supers have never had even one brood cycle, you can store these supers in any way you wish. If any damage from wax moth does occur it will be minimal.

Wax moth females cannot lay eggs if light is present. The female spends her days in a tree but enters stored equipment during the night to lay eggs. You can make good use of these facts by preparing a storage place for comb. The cost is minimal but will save you time and money. Your storage shed can be simple, free-standing, part of other storage or part of a nice honey house. You need only to consider the amount of equipment you wish to store, a source of light and protection against mice.

If you are storing comb inside of another structure, that structure may already have protection from mouse damage. All you need to do is provide light. Store boxes of comb in stacks of about five to seven, alternating each box 90° from the one below. A low-wattage light bulb burning 24 hours a day is all that is needed to deter wax moth.

Cross stacking supers so light can penetrate goes a long way in preventing damage.

For a small number of boxes, you can construct a base or frame for stacking boxes so they are not resting on bare ground. Small-mesh hardware cloth must cover the base or frame for mouse protection. If you make short stacks, say five boxes, you can stack each box right on top of the other. A hardware cloth top will prevent mice from entering. A low-wattage light bulb placed above the stack will need to burn 24 hours a day.

You can make any sort of storage for boxes that fits your bee operation. All you need to do is think of using light as prevention. BC

Ann is out in the barn, cleaning frames in Flint Hill, VA.

Internet Marketing

Jamie Morehead

I can already hear you groaning, "the only screen I want to look at is attached to my pollen trap." But, even beekeepers cannot ignore the influence of the Internet when we are away from our apiaries. It is the most powerful tool we have to let others know about hive products, honey bees and beekeepers.

I've received many compliments on our lazybeestudio.com website over the years from beekeepers. Inevitably, they will follow with a lament on how they'd like to have a site themselves—whether for their honey business, local bee club or just to share their beekeeping experience with others. This article is not intended to teach you exactly how to design or code a web page. Rather, the intent is to help you take the basic steps you will need to make in order to reach your target audience via an internet web page.

Bee Clubs

A few months back, I was talking with the President of one of the county bee clubs I belong to and asked if the club had ever considered having a website. He didn't believe that the members would be interested, as most of them are of retirement age and many of them didn't have computers. He said this just as a first time visitor, a 10 year-old boy, walked in (it's rare to have young faces at these meetings). I pointed to him and said, "I bet he has a computer." I do not say this lightly; if we are going to replace the "old-timers" we loose each year, then we must begin to connect with future beekeepers using the medium, which has become their primary mode of communication.

I urge you, the person who loves beekeeping and seeing a new beekeeper hungry for knowledge, to take the first step and secure "yourclubname.org" for your organization today! Utilizing the web will provide a way to remind current members of upcoming speakers, meeting times and locations and can reduce the amount of phone calls and postage your club spends on communications.

E-Commerce

Bonita Bedard is a business partner at Vermont HoneyLights in Bristol, Vermont. The partners started the company eight years ago. About five years ago they moved to their present location and launched their website, vermonthoneylights.com. Initially, the business was printing and distributing a paper catalog at considerable expense. Bedard states that the partners began their ecommerce site as a way of "reducing costs and conserving paper resources." Their beeswax products are a renewable, natural product and they felt that the company's marketing practices should reflect this.

Blogging

A blog is a website with journal-like entries. This is ideal for the semi-retired beekeeper who recently approached me and asked if it would be hard to make a web page. He is interested in sharing his experience with others and he is very knowledgeable. I imagine it would be something similar to George Imrie's Pink Pages.

Where Do I Start?

The first thing you should do is purchase an internet domain name. I recommend you register it at GoDaddy.com, where a domain will cost you $8.95 per year. Choose a ".com" for your business or ".org" for your non-profit group. The name should be as short as possible and easy to remember. Registration includes domain forwarding, meaning your domain can be linked to any website you choose (this makes it possible to switch servers or hand over the site to a new webmaster without having to advertise a new web site address). Free web hosting is included in the domain registration with GoDaddy, as well as a basic site and blog (with ads). This is a quick and affordable way to establish a site for a club or personal blog. GoDaddy offers banner-free hosting for under four dollars a month.

However, if you are looking for a free hosting service without banners, check out AwardSpace.com. You can forward your domain to this server. You can use web layout programs like Microsoft FrontPage or other basic web design programs to create your site and publish it to this server. There will be some limitations on advanced web program functions for the free hosting option.

If you are looking to sell your hive products, another way to get started without the expense or hassle of setting up a fully functional ecommerce site, is to set up an account with localharvest.org. You are able to list information about your agricultural business and even create a catalog of items for sale. Local Harvest will process the payments and you ship the products. You will receive a monthly sales check, minus Local Harvest administration and processing fees.

For a fully functional independent e-commerce site, Yahoo! offers a range of hosting options, including merchant solutions at: smallbusiness.yahoo.com. This is a much more expensive option. It is best that you begin selling with the least expensive method until your sales have grown to the point that you need to upgrade. Remember, securing a domain name will allow you the flexibility to switch to another hosting service as your business grows.

Again, the first step is to carve out your real-estate by claiming your domain and deciding on a hosting service which meets your needs and budget. Next time we'll review the process of designing a web page from the initial planning stages and highlight fundamental design principles from a graphic perspective. As Bedard states, "a site should be welcoming, but unfortunately many sites are graphically confusing." She advises that those looking to create a new website "work with a designer to help give the site clarity, using a simple, approachable and clean look." BC

Jamie Morehead is a graphic designer, and co-owner of LazyBee Studios.

Honey Plant Catalogs

Connie Krochmal

It's that time of year again. Garden mania has set in with the arrival of the 2007 catalogs. There are literally hundreds of companies specializing in garden-related items. Of the ones that offer seeds and/or plants as their primary business, some of my favorites are profiled below. Most of these also sell some types of garden supplies, gardening books, and other things of interest to bee gardeners.

At this point, I should let my bias be known. I like garden catalogs that are well-organized. An index or table of contents is helpful if the seeds/plants aren't in alphabetical order. In my view, color photos aren't essential. With a few exceptions, I generally prefer free catalogs. Unless noted otherwise, the ones featured here are available free of charge.

Baker Creek Heirloom Seeds

For heirloom gardening, the Baker Creek catalog is a dream come true. With color photos, it has page after page of heirloom, open pollinated vegetables, including over one hundred kinds of melons. Baker Creek also sells seeds of herbs, flowers, and wildflowers as well as garlic bulbs. The seeds are untreated. Gardeners can order year-round by mail, phone, fax, and online. They have a retail store in Mansfield, Missouri.

Bluestone Perennials

Those new to perennials will do well to start with time-tested varieties from Bluestone Perennials. This is one of the few remaining companies that actually grows and produces its own plants. Both Northern and Southern gardeners will find this color-illustrated catalog lists suitable perennials for their climates. In addition, Bluestone also sells some shrubs and vines. You can place orders by mail, toll-free number, fax, and online.

Burpee

Available for over 130 years, the full-color Burpee catalog continues to be a long-time favorite. With over a hundred pages, it's about equally divided between vegetable and flower seeds, some of which are organic. In addition, Burpee also sells certain kinds of plants. Among these are vegetables, bedding plants, perennials, and small fruits. Gardeners can order by mail, toll-free number, fax, and online.

The Cook's Garden

In recent years, the Cook's Garden has made a name for itself among kitchen gardeners. They offer seeds for the best varieties of vegetables, culinary herbs, and flowers. Many of these seeds are organic and untreated. In addition, they have selected varieties of seed potatoes, small fruits, and herb plants. Throughout this color-illustrated catalog are recipes. Order by mail, toll free number, fax, and online.

Dutch Gardens

Garden trends come and go. But, bulbs have retained their popularity. Dutch Gardens sells top size, top quality bulbs, which give consistent garden performance. Their Fall catalog focuses on hardy, spring flowering bulbs, while the Spring edition features tender ones that bloom during the Summer. In addition, Dutch Gardens also sells perennial plants. Customers can order by mail, toll free number, fax, and online.

Hartmann's Plant Company

Whether you garden in the North or South, this color-illustrated catalog has blueberry bushes and other fruits of interest. Hartmann's has been supplying gardeners with cultivated and native fruit plants for over 60 years. In addition to small fruit plants, they also sell some kinds of tree fruits along with herbs, and unusual ornamentals. For those with small gardens, Hartmann's has fruit plants that can be grown in containers. Orders can be placed by mail, phone, fax, and online.

J.L. Hudson, Seedsman

The J.L. Hudson seed catalog is one of the best kept secrets among serious gardeners. With black and white drawings, this is a simple listing of vegetables, herbs, and other plants of interest. Most of these seeds are untreated. This catalog contains helpful articles about growing plants from seeds. It gives brief descriptions and details on how to grow each species. Most of the varieties are either heirlooms or traditional, open pollinated ones. You can order by mail, fax, and online.

Klehm's Song Sparrow Farm and Nursery

Flower lovers will treasure the Klehm's Song Sparrow full-color catalog. With nearly a hundred pages, this has unique perennials and woody plants. Keep this catalog handy. You'll return to it over and over for the wealth of gardening information that it contains. It has in-depth information about growing and caring for each kind of plant. Place orders by mail, toll-free number, fax, and online.

Miller Nurseries

Over the years, Miller Nurseries has become a leading source for fruit trees. They offer a wide variety of tree fruits as well as nut trees and small fruits, such as kiwis. The catalog also lists a number of roses and other ornamentals. Illustrated in color,

this has a helpful table of contents. With each plant order, Miller sends a useful, 32-page planting guide. Orders can be placed by mail, toll free number, fax, and online.

Nichols Garden Nursery

Nichols strikes a pleasing balance between vegetables and herbs with a good selection of flowers. They have been supplying gardeners with untreated seeds, plants, and bulbs for over 50 years. This has color illustrations. For each type of vegetable, there is a helpful box giving general information about how to grow it and the days to harvest. Orders can be placed by mail, toll free number, fax, email, and online.

Oikos Tree Crops

While nuts are merely a sideline for many mail order companies, these are a specialty with Oikos Tree Crops. In addition, they have certain kinds of fruit trees – especially ones suited to cold climates. Oikos sells a wide selection of wildlife food plants, including many different kinds of oaks. The color-illustrated catalog also features fruiting cacti and other perennial edible crops. Customers can order by mail, phone, fax, and online.

One Green World

The name says it all. This company offers heirloom and new varieties of tree fruits and small fruits from all over the world. The full-color catalog also has a wide selection of unusual ornamental trees, shrubs, vines, and native wildflowers. For each kind of fruit, a box gives useful information about the plant's cultural needs and the bloom time. Order by mail, toll-free number, fax, and online. They have a retail store in Molalla, OR.

Park's Seeds

This has been an American classic since 1868. The 2006 edition had over 150 pages brimming with seeds, plants, and bulbs. It features vegetables, herbs, flowers, ornamentals, and houseplants. This color-illustrated catalog has an invaluable gardening guide/index that is located in the center next to the order blank. Easy to use, this gives specific details on planting the seeds, their germination times, and the plant's cultural needs. You can order by mail, toll free number, fax, and online.

Raintree Nursery

When ordinary fruits are insufficient, look to Raintree for distinctive varieties. For 35 years, they've offered heirloom and modern varieties of fruits and edible crops. They also sell some ornamentals as well. This full-color catalog has helpful charts and lists that give the order of ripening and pollination needs for the different fruit varieties. Order by mail, phone, fax, and online. The store in Morton, Washington is open for part of the year.

Renee's Garden

Not every catalog arrives in the mail. The one for Renee's Garden is only available online. This is worth checking out. Among Renee's specialties is heirloom and open pollinated varieties of vegetables, flowers, and herbs. Each year, they introduce new gourmet vegetables and herbs from Europe and elsewhere. You can order by mail, fax, and online. In addition, seeds are available at independent garden centers and nurseries.

Richters Herbs

Richters Herbs issues American and Canadian editions of its catalog. This lists over 1000 herbs, vegetables, and roses. Those needing multiple plants of the same herb can buy plug trays of the more popular varieties. This color-illustrated catalog indicates which varieties are easy or difficult to grow. Customers can order by mail, phone, fax, email, and online. Shopping at the greenhouse/retail store in Goodwood, Ontario is also an option.

Seymour's Selected Seeds

Rather than offering everything under the sun, Seymour's Selected Seeds has found a unique niche. This company specializes in the sort of plants that one would find in English cottage gardens. The catalog lists both heirloom and traditional varieties of flowers. Most of these are sold as seed. However, they also have various kinds of bulbs and other flowering plants, such as vines. Gardeners can order from this full-color catalog by mail, toll-free number, fax, and online.

Southern Exposure Seed Exchange

Each area of the country has its own unique climates and garden challenges. That's where regional catalogs come in handy. Those in the South and Southeast can rely on Southern Exposure Seed Exchange for suitable kinds of vegetables, herbs, and flowers. Offering untreated seeds, they specialize in heirloom and traditional, open-pollinated varieties. With color

illustrations, the catalog gives helpful information about growing and maintaining each type of crop/plant. You can order by mail, phone, fax, email, and online.

Southmeadow Fruit Gardens

Connoisseur and heirloom, hard-to-find fruits are a specialty with Southmeadow Fruit Gardens. In addition to tree fruits, they also sell rootstocks, small fruit plants, crab apples, and wildlife plants. While the price and variety list is free, there is a charge for the extensive catalog, which has over a hundred pages. This gives a complete history and description for each fruit variety. It is illustrated with historical drawings and photos. Orders can be placed by mail, phone, and fax.

Stark Brothers Nurseries

For nearly two centuries, Stark Brothers has been a favorite source for fruit plants. They specialize in heirloom and modern varieties of tree fruits and small fruits. The full-color catalog has helpful charts and tables with information on the fruit ripening times as well as details on growing each kind. In addition to fruits, Starks sells a number of ornamental plants. Order by mail, toll-free number, fax, and online. They have a retail store in Louisiana, Missouri.

Territorial Seed Company

Organic gardeners can look to Territorial Seed for everything they need. They sell conventional and organic seeds of open pollinated and hybrid varieties of vegetables, flowers, herbs, and cover crops. Some of the varieties are available as both seeds and plants. This color-illustrated catalog also lists organic fertilizers as well as organic pest and disease controls. You can order by mail, toll-free number, fax, and online. They have a retail store in Cottage Grove, Oregon.

Thompson and Morgan

In order to succeed, gardeners need information on how to plant each kind of seed. That's where the Thompson and Morgan catalog comes in handy. For each variety, it gives the germination requirements as well as the plant's cultural needs. Founded in England in 1855, this company issues an American catalog. The 2007 full color edition has over 200 pages. This has separate A-Z sections for flowers, vegetables, and herbs. Orders can be placed by mail, toll-free number, fax, and online.

Well-Sweep Herb Farm

Well-Sweep has been in business 38 years. This is one of the few companies that specialize in herb plants. Among their specialties are herb topiaries, basils, lavenders, rosemarys, scented geraniums, and thymes. The catalog gives in-depth information about each variety in an easy to use table. Order by mail, phone, and fax. Gardeners can also visit the farm, which is open year-round.

White Flower Farm

White Flower Farm is legendary among gardeners for their daffodil collections. But, there's more to this company than meets the eye. They issue several full-color catalogs a year, including spring, fall, and holiday editions. They offer hardy and tender bulbs as well as perennials, woody plants, and small fruit plants. The Spring catalog also lists seed potatoes, and some vegetable plants. Orders can be placed by mail, toll-free number, fax, and online.

Wilhite Seed

Wilhite's color-illustrated catalog is sure to stir one's passion for vegetable gardening. Though this has some flower seeds and wildflower seed mixes, vegetables continue to be their main specialty. In addition to seeds, Wilhite also sells some vegetable plants as well. Among these are sweet potatoes, leeks, and onions. Bulk seeds are available. Gardeners can order by mail, toll-free number, fax, and online. BC

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

PERIODICALS

RURAL HERITAGE – bi-monthly magazine in support of farming and logging with horses, mules, and oxen. Subscription includes THE EVENER Workhorse, Mule & Oxen Directory; $29 for 6 issues; sample $8.00. Rural Heritage, 281-B Dean Ridge Lane, Gainesboro, TN 38562. 931.268.0655, www.ruralheritage.com

THE SCOTTISH BEEKEEPER. Magazine of The Scottish Beekeepers' Assoc. Rates from Enid Brown, Milton House, Main Street, Scotlandwell, Kinross-Shire KY13 9JA, Scotland, U.K. Sample $1.

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INNER ... Cont. From Page 10

Here's a thought. If you put generic honey in a barrel you'll get a basement price. Put it in bottles, with a name on an attractive label, make sure it tastes good and is clean and you'll get top dollar.

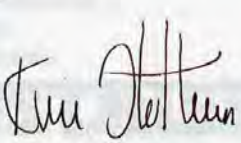
Likewise, sell me a generic queen, one that'll be dead before fall and you'll get, and deserve, basement prices – and little customer loyalty. But Hail the producer that finally gets her head out of the sand and no longer denies the obvious...that they, too, can't exist with those same chemicals; and they, too, don't want to anymore! So they begin to make queens like the Brethren. And then, there'll be queens that stay alive, queens that produce bees that stay alive – and, by gosh, we will gladly give you gold, and sing your praises.

We have fouled our nest for far too long. So today, let's quit making more poison, more silver bullets, more miracles, more quick fixes. Then, you researchers, queen breeders, queen producers, commercial beekeepers and anybody who wants to keep bees in a box – let's make a queen that stays alive, a queen that produces bees and honey, one that's predictable, productive and profitable, without chemicals and without poison.

The sad fact is that after 20+ years of *not* having those kinds of queens we have, as an industry, watched nearly two thirds of our number leave the fold. The clock is ticking friends, and we are flat out of time.

The solution is simple. Buy and produce *only* bees that survive, that produce, that live. Not third-hand almond bees. Not "whatever-they-mate-with" bees. No more regular bees. No more.

The Brethren Of Better Beekeepers are still a small congregation. In another 20 years though, they will be all that remain. Pray that they, like their bees today, grow and thrive and prosper.



Display Advertisers

We're back with the next installment of "Letters from a Beekeeper's Wife." Let us see what "Mary" has in store this month.

At convention, February 1, 1917.

Dear Sis:

I know you are anxious to know how we are enjoying the convention, so while I am right here in the midst of it I'll take time to give you my impression.

Rob is having the time of his life. To begin with the first session - the only impression I had was of heavy solemnity. The beekeepers who came into the dark, stuffy room in the Capitol assigned to us were heavy-bearded, heavy-footed, solemn and important! I was almost frightened! They all wear terrible red badges with a queen bee on! There were two other wives who sat with their husbands, and we all listened very respectfully and attentively to the President's address and reports of committees. I looked around during the reading and discovered that although there were a great many elderly bearded men present, there was more than a sprinkling of young, clear-skinned, wide-awake-looking men too. And some of the older men looked younger after I had heard them talk - especially good old Mr. Randolph.

I expected a great deal from the papers that were to be read - but, oh dear, such a disappointment! They were nothing more than the endless discussions I hear at home between beekeepers. The same old subjects - Queen-rearing, Bee Diseases, Marketing Honey (about which most of the men seem to know almost nothing) and the men who talked didn't know any more about their subjects than the other men apparently, but, just like all beekeepers, when a paper was ended there was wordy, wandering discussions of it. As every man had to air his pet theory - every beekeeper has a pet theory - the discussion wandered off in all directions and never seemed to arrive. They talk about the aimless discussion in women's clubs, but it can't compare with a state, or national beekeepers' convention. I wondered to myself what Rob can get out of this organization to want to come year after year.

Rob read a paper on "Home Marketing of Honey" in which he described our work last Summer. One man actually said that it was not right to charge 20 cents a pound for honey, and several intimated that Rob had not really done what he said! That made me furious, and I was glad that a young beekeeper rose and completely annihilated Rob's critics, finishing by telling them that a man who will retail honey for 10 cents a pound is little short of a fool. Rob's paper was the best one read yesterday - of course I am unbiased in my judgment.

However, today the apiarist from the State College talked, and, as every one had worked his pet theory out of his system the day before, the discussion stayed somewhat nearer the topic. I noticed that the younger men almost always led in progressive ideas, but I must again include Mr. Randolph, who is almost 80 years young, and the conservative old heads would shake in disapproval. I suppose it was the same in Langstroth's day when he tried to introduce the movable-frame hive - and you know Susan B. Anthony had troubles of her own.

I've been over to the last session but slipped out to write to you. They were carrying in a question-box when I left. That's the funniest thing! Any one who desires writes out a question he would like to have answered. They are read aloud and then any one at all answers, whether he is an authority on the subject or merely thinks he is. I have an idea that some of them put in questions that they expect to answer themselves, for a lot of the men have not had much chance to talk today while there were real subjects being discussed. There will be five or six absolutely different answers to each question, so that I should suppose that an amateur would be pretty well muddled in the end.

Of course now that I've been with these beekeepers for two days I begin to see why they like to come to conventions, but I don't believe that most of them know the real reason. It isn't for the papers, and certainly not for the awful question-box, but for the human contact with beekeepers - and they are a mighty nice lot of people. After the sessions it's the hardest thing to pry Rob loose from any little group that happens to form, and last night he stayed up and talked to the apiarist from the college until half past one. Poor Mr. Apiarist! I'm not pitying Rob for I'm sure it was his fault. The beemen hang around that dingy room or the hotel lobby, swapping bee stories until the lights are turned out. Rob says the convention has been a success this year, for the usual bore with a new hive did not come, and the man who has kept bees a few months but knows more about beekeeping than all the rest put together has been kept in the background.

I'm glad I came for I have met lots of men that I've known by name for a long time. Tonight we leave for home. Goodbye.

Mary

We can't wait to get together and do it again. Yes, it's true, some things never change. Talking about bees is as fascinating as the bees themselves are. And talking about bee associations is almost as good. Meetings, conferences, field days; these all are occasions for satisfying bee talk as well as chewing on our dissatisfactions.

Mary

At The Convention – 1917

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