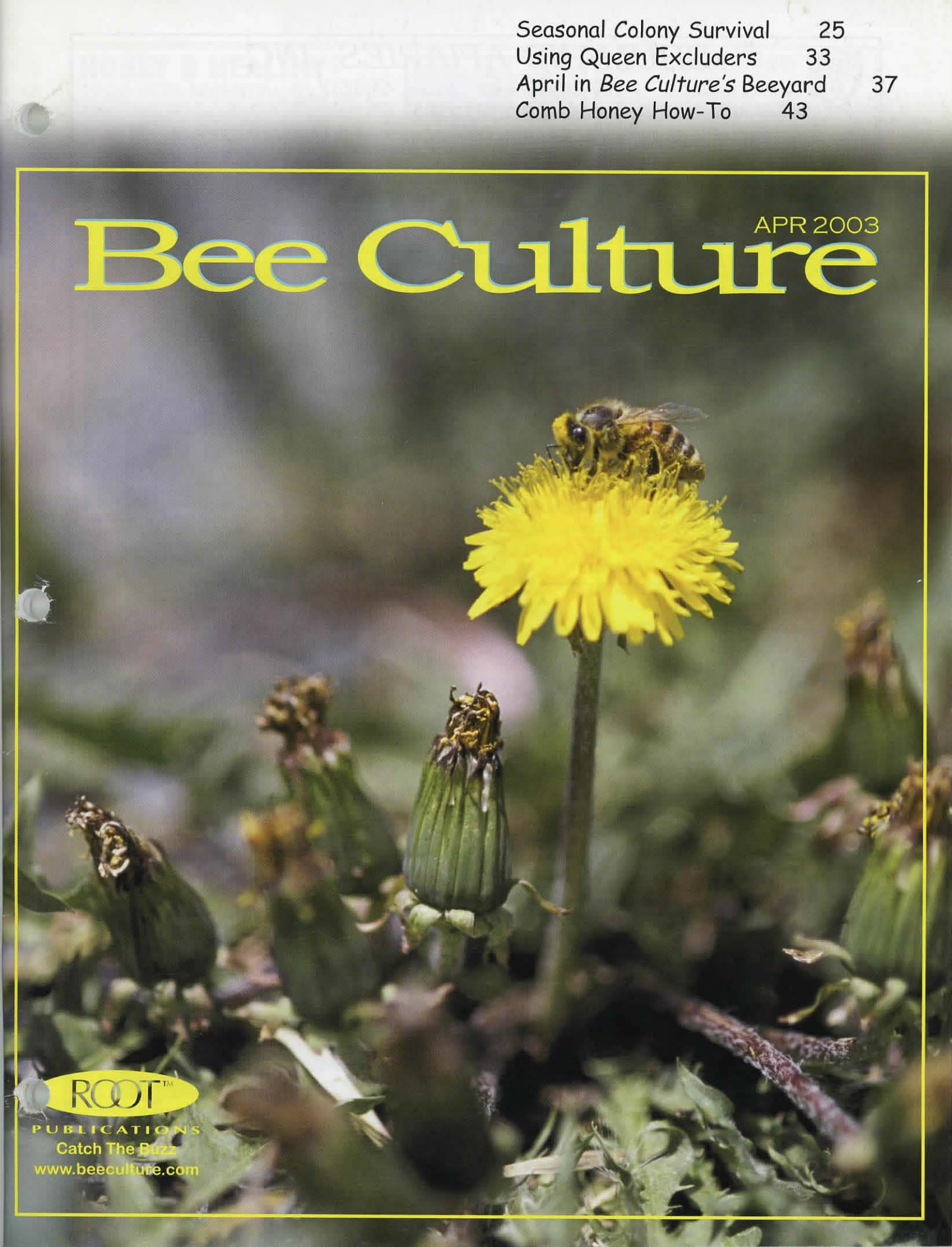
Bee Culture

APR 2003



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Bee Culture

THE MAGAZINE OF AMERICAN BEEKEEPING

APRIL 2003 VOLUME 131 NUMBER 4

FEATURES

Dandelions are up or on the way, and are certainly one of the must-have early flows just about everywhere for both *pollen and nectar. Jeff Ott lives in Colorado and writes for us on occasion.*

DEPARTMENTS & COLUMNS

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KEEP IN TOUCH

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MAILBOX

Ah, Pollen

I enjoyed the article by Lloyd Spear entitled *Ah, Pollen.* Informative articles like this help those of us who have little knowledge on yearly colony management to gain more knowledge on the subject. I personally would like to see more articles like this subject. Some I had in mind would be how to efficiently clean pollen, how to measure moisture in pollen, the various ways to dry pollen (I use a box with light bulbs and a fan), etc. In my humble opinion you have a high quality magazine and during the Winter I find myself wishing it were a weekly publication. Keep up the good work.

Garrett Martin
Nappanee, IN

Support NHB

I have been a commercial beekeeper in central California for about 30 years. During this time I saw honey prices rise from 12 cents per pound to current $1.50 per pound. This rise was never a slow steady rise, but often leaps forward, then a slide backwards, then another jump, and then stagnation, and so on. In those early years, California had its own honey board. This board produced brochures for distribution to the consumers.

Compared to the National Honey Board, as it currently promotes honey, the California Board was just a flicker of a flame.

The National Honey Board took that flicker and turned it into a giant flame. I would like to see this Board turn this giant flame into a roaring torch. The only way this can be done is by defeating the upcoming termination referendum.

Tariffs, antidumping actions, and legal challenges cost us dearly. Are we so short sighted that we cannot see far enough into the future to realize that honey must be promoted by all means necessary to just hold our share of the marketplace?

I challenge all of the honey industry to look very seriously at what the costs of shutting down the National Honey Board would be. That 1 cent per pound that we currently pay will look like the best bargain we ever had. I urge you to vote to keep the National Honey Board in place, and work to help this board broaden its capabilities. With the NHB we can continue to expand our markets, and retain our higher prices for our excellent product.

Have you ever written or called the NHB for promotional materials? Please do. They have many items for you to give to your customers, prospects and the general public. Take advantage of all the good work that has gone into these items. It might surprise you of the range of topics these materials cover. For those of us who pack some of our honey, these materials are extremely valuable. Try them, you might like them!

Defeat the termination referendum. Vote to retain the National Honey Board!

Bob Miller
California

•

What were you doing in the honey business in 1953? I was a teenager and I can remember making a nice crop of honey, putting it in drums, and had the honey trucked to M. R. Cary Corporation in Syracuse New York. I received 7 cents per pound for the honey. I was glad to get that price, too. I then decided I could put honey in jars and sell it at 35 cents per pound or three one pound jars for a dollar and make more money. Boy we have come a long way in 50 years.

Today U.S. production of 200 million pounds per year varies little from one year to another unless there is a dry weather disaster in this country. Our usage of honey in this country is about 350 million pounds per year. The National Honey Board cannot take all the credit but they have and do work hard with users of honey in formulations in cereals, breads, sauces, beer, and dog food to name a few. They work with people on product development to use honey in their products—both existing ones and new products. We should all be behind the hard work the National Honey Board staff puts in every day instead of all the time voting on the National Honey Board's survival.

Who benefits more from the higher usage of honey than does the importer, packer, and honey producer of this great land of ours. I support the work these staff people are putting forth and I hope you will also. I hope you will also work to get your friends to support the continuance of the National Honey Board.

Edward J. Doan
Commercial Beekeeper,
Producer/Packer Hamlin, NY

Anti-Dumping At Risk

Today we are enjoying record high prices. The honey industry is starting to recover from years of disastrously low prices. Debts are being paid down; old bee equipment is being replaced. New trucks and loaders are being purchased. Most in the industry are cautiously optimistic.

We now have a touch decision to make. Basically, we are at a crossroads. Do we protect the prices we've gained through the anti-dumping action or do we sit back and let the market take its course? If we let the market prevail unrestricted, within a year, possibly two, we will be back to the 50-cent a pound level.

In December 2002, nine Argentine exporters and one Chinese exporter asked to partici-

Continued on Next Page

MAILBOX

pate in commerce's first administrative review of the anti-dumping (AD) order. Also one exporter from each country requested a "new shipper" (NS) administrative review, thus, a total of 12 exporters will likely be reviewed by commerce during the first administrative review and the new shipper reviews. Also, during December 2002, the Government of Argentina asked Commerce to conduct an administrative review of the counter-vailing duty (CVD) order on honey from Argentina.

Assuming Commerce accepts each exporters request for a NS review and initiates the proceedings, the U.S. imports of each exporter will be able to satisfy the duty deposit requirement for their honey imports by getting an insurance company to issue a bond in an amount equal to the cash deposits that otherwise would be required. This gives the new shippers and their U.S. importers a tremendous advantage over the other Chinese exporters.

The dumping margin announced by Commerce for the new shipper in the reviews final results will be 1) the amount by which the new shipper's export sales that were actually reviewed during the NS review were dumped (and, thus, the actual amount of dumping duties that are owed on that sale); and 2) the amount that will become the new shipper's dumping cash deposit rate until a new dumping rate is calculated for the new shipper.

Of course, new shippers arrange with their U.S. importers to sell their honey for a single sale that typically is subject to the NS review at a price that is high enough to guarantee that Commerce will find that the sale was not dumped, and thus will issue the new shipper a zero percent cash deposit rate.

Once the review is concluded with the new shipper receiving a zero percent dumping margin, U.S. importers of the new shipper will not have to post either cash or a bond on its imports from the new shipper. All of this underscores the importance of the domestic producers vigorously challenging the new shipper in a NS review. Mike Coursey's experience with many NS reviews has taught that the best strategy in an NS review is to challenge the new shipper at each and every stage of the review, because the greater the number of challenge points, the greater the chances of finding a fatal defect in the new shipper's sale that is under review.

The AHPA has again asked Mike Coursey, (Collier, Shannon, Scott) to represent the honey industry's interest in these administrative reviews, the Argentines and Chinese have hired the law firms of White and Case and Grunfeld, Desiderio, Lebowitz, Silverman, & Klestadt. Both firms are extremely experienced in anti-dumping matters and both have considerable experience in representing Chinese exporters in regular and NS reviews. The Grunfeld firm recently convinced a judge of the Court of International Trade to reverse Commerce on a great many issues in Commerce's anti-dumping investigation of frozen concentrated apple juice from China. In the first administrative review of that order, they obtained a zero dumping rate for 10 of the 11 Chinese exporters requesting review.

Challenging a review is very expensive, Mike Coursey, (Collier, Channon, Scott), has agreed to represent us through the administrative review for $540,000 plus out of pocket expenses which usually run around 10%. They have also agreed to represent the AHPA in the CVD administrative review for $75,000 plus 10% out of pocket expenses. The cost of both cases of the review does not include any court appeals that may be brought by either a foreign or domestic party at the conclusion of the administrative review.

The AD and CVD administrative reviews will cost $615,000. Collier, Shannon, Scott have agreed to stretch the payment fo 18 months at a monthly fee of $34,166.67 plus out of pocket expenses. We will be billed the 1st of each month with payment due by the 15th. In the event that any statement is not paid as agreed upon, Collier, Shannon, Scott will have the right to discontinue further service and to withdraw as AHPA counsel in any pending proceeding. In other words, in the event of non-payment, further work will be discontinued.

We are now challenged with the task of raising the money needed to mount a successful challenge to the administrative reviews.

We have seen the price of honey to the producer increase over one dollar a pound since the inception of the AD-CVD. The AD action cost the industry around one million dollars and we received a return of $175,000,000. That money went directly into beekeeper pockets. No trickle down here. With the money in beekeeper pockets, the only way it could trickle was up. The price of honey is not too high. It's just that it was too low for too long. We are now receiving just compensation for all our efforts, hard work, and investments.

Now, each of us has to decide whether we are willing to defend our markets or want to return to an open market with all the ramifications that go with it. Many of you have already paid or pledged money to fight the reviews. We really appreciate you stepping up and saying "Count me in, I want to protect our market."

We want everyone who produces honey to be a part of the effort making sure our side is represented in the administrative reviews. If we are not there, the Chinese and Argentine exporters will have a field day. We want everyone to participate. You, your neighbor, everyone. If we all work together, we can raise the money needed to win. It will be a sad day for the honey industry if we run out of money. Your investment is absolutely critical to our success.

Please send your donations to AHPA, Karen Tubbs, Box 3, Webb, MS 38966.

Richard Adee
Bruce, SD

Corrections

I would like to correct errors made by the authors of "Poplars and Bees Don't Mix," in the

MAILBOX

January issue of *Bee Culture.*

The mistakes may be due to a misunderstanding or poor cell phone connection which did eventually cut off the call from author's end..

1. The spelling the fungus "*Bavaria*" is "*Beauveria.*"
2 **Imidacloprid** is not a new chemical and it **IS** toxic to bees when they are exposed to residues or direct treatment. It is not **Calypso**; it is known as any of the following, Marathon, Admire, Merit, Gaucho, and others. **Calypso** is **thiacloprid**, a chemical that the manufacturer claims does not harm bees. It is not available in the U.S. It has only been used in limited research in the U.S.
3. It is not proper to state that I "discovered a possible insecticide that may not harm bees." I stated that I was aware of a chemical (thiacloprid) that may not be toxic to bees.

Jeff Schnurr
St. Paul, MN

EAS 2003 – August 4-9 easternapiculture.org
HAS 2003 – July 9-12 heartlandbees.com

INNER COVER

Here's something I don't understand. Those that rule the world we live in do not allow U.S. beekeepers to use liquid formic acid as a control agent for pests or diseases in honey bee colonies. It's a food grade product, naturally occurring in honey and when used according to well established safety procedures and research recommendations doesn't kill the queen (though a bit of brood may suffer), doesn't run bees out of a colony, and pretty much takes care of mites. It's easy, and economical to use, and mites developing resistance will be a long, long time coming. If ever.

At the same time, no one, as far as I can tell, is saying anything about fogging the inside of a beehive with food grade mineral oil. It is a pure product, but about as natural in a beehive as a Crisco patty. Moreover, the application machine, when used incorrectly, will blow flames into the hive, or on beekeeper's feet, or the surrounding grass. Not a good idea in a drought.

Both can be dangerous or benign, and both seem to have promise as a mite control agent. You can injure your lungs or eyes, or be consumed in fire if you're not careful. But then, try and get a hive tool on an airplane, or see what happens when you tip over a smoker in a dry field, or put a coumophos strip in your pocket, or just open the wrong colony on the wrong day. Any of these will make you wish you had tried something else.

So, like I said. I don't understand this at all. We do a lot of things as beekeepers that can outright kill us if we're not careful. Except liquid formic acid it seems. Go figure.

•

How much honey did the U.S. consume last year? Estimates vary, mostly due to how that amount is calculated. That is, what figures are used. National Honey Board figures use the numbers they can document, based on assessments collected for domestic and foreign honey, plus other reliable government figures. Their total was 1.2 lbs. per person in 2001. Here's the standard formula to figure it out for 2002:

64,556,000#	+	171,140,000#	+	191,801,600#	39,047,000#	5,000,000#	=	Total
Carry Over From 2001		Amt. Produced In U.S. in 2002		Amount Imported	Carry Over to 2003	Amount Exported		Consumed

Then,

Total #s Consumed / Total Population (As of July 1, 2002)	=	Pounds/Person Consumed	=	383,450,600 lbs. / 288,369,000 people	=	1.3 lbs/ person

You can do the math, (actually, check mine), but as near as we can figure, it comes to 1.3 lbs/person, or 20.8 ozs/person. This figure moves up and down a little each year, generally ranging from 1.1 to 1.4 lbs/person. It hasn't changed much in a decade.

The average production per colony, for all the colonies USDA counted comes to 67.8 pounds. If you're a numbers person, that works out to every colony supplying a year's worth of honey for 52 people. It's a figure much like every American farmer feeding 2,000 people, interesting but essentially meaningless.

Since we don't feed honey to children under a year old, and lots of people don't like it and don't buy it, the actual amount those of us who eat honey each year consumes is probably much higher. Good to know, but hard to determine.

Per capita consumption is an average, which has value in some descriptive terms. But, one average that's been tossed around lately goes like this:

A small group of beekeepers are at a meeting and are complaining about money and income. Suddenly, Bill Gates bursts into the room (the wrong room it seems). Know what happens? The *average* income of everyone in that room goes way, way, way up. But only Bill is still rich.

Same with *average* yield/colony. Most years a 68 lb. average (at about $.65/lb.) would put commercial and

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Liquid Formic Acid; Honey Numbers; & Raising Queens

Commentaries

A Modest Proposal

"You've got to be kidding! Another beekeeping organization! Now?, " Joe Traynor's disbelief in the email was almost audible. (Traynor, a pollination broker in Bakersfield, California and I, a hobbyist in Burlington Vermont, have been corresponding for a couple of years.) "We've got the American Beekeeping Federation, the American Honey Producers Association, the U.S. Beekeepers Association the National Honey Packers and Dealers Association, throw in some of the bigger state groups, all arguing about the National Honey Board and you want more confusion and blood on the floor? Are you a sadist?"

"Nah, I'm simply proposing a specialty honey association modeled on the Specialty Coffee Association of America, the Independent Oil operators, the Institute of Craft Brewers, that would look after the interests of the beekeepers who sell specialty or niche honey."

"And you don't think the NHB does that now? "

"Yes and No. The battle there is first whether to kill it and secondly whether to promote domestic vs imported *bulk* honey. Those guys are beating up each other over barrels and totes and tankers.

"So?"

"So, as the Kikuyus say in Kenya, 'When the elephants fight, it's the grass that suffers."

"What!? The Honey Board is working on varietal honeys now. Their slogan for honey is a 'natural sweetener with functional properties.'"

"I know, and that's good, but the people on the board are the big guys and the people attacking them are big guys. It's a battle between the honey-in-the-barrel men (and women). This new association would detour around this fratricidal battle and go right to the smaller customer "

"Where did you get this crazy idea?" Joe asked. "Well, two places, really. One of my marathon-training buddies, Rick Peyser, works for a specialty coffee company here in Vermont. On our two-hour runs we have lots of time to talk, and we do –about world affairs, local politics, our kids, our aches, my school and his industry. Twenty years ago, Rick told me, there was one coffee organization, the Coffee Institute which ran from the mega-companies to the tiny roasters. Of course, there were very few at both ends and even fewer in the middle. Starbucks was still small, as were Peet's and Green Mountain Coffee Roasters, where Rick works. About 50-70 people got together and said: 'Look, we have very little in common with Chase and Sanborn and Folger's and General Foods. Look we've got a different philosophy, we're different size. We sell to different people. We've got different interests from the big guys. This year, the specialty coffee convention brought 7,000 people together from around the world. They've got only about 15% of the overall volume of the coffee market, but they have 40% of the dollar sales and they set the standard for quality. "

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Spraying Problems

If you missed the article on Poplar spraying in Minnesota and its impact on bees, you should go back and read it now (Poplars and Bee's Don't Mix, *Bee Culture*, January, 2003).

Along with a handful of other beekeepers, I was involved in the pesticide wars in the 1990's, revolving around the reappearance of an old killer – Penncap-M, or encapsulated methyl parathion. Concurrently, beekeepers were trying to contain efforts to "update" the labeling language on pesticides, pushed for by state regulators and the ag-chem industry.

What I found particularly compelling about the Poplar story wasn't the carnage and the financial loss to beekeepers, although that's certainly important. What really jumped out at me was how similar the theme is to what beekeepers experienced in several states during the Penncap kills, as well as any number of other pesticides on other crops, in other years and other states: deny, delay, postpone, confuse, obscure. Take the beekeepers down an endless number of pointless rat holes, argue over label definitions, repeatedly fail to find the suspect chemical, schedule pointless meetings and wear the beekeepers down until they just give up and go away.

But first, a little background will help to understand what is really going on behind the scenes with pesticide problems like these.

Regulation of pesticides falls largely under federal rather than state jurisdiction, under a body of laws, regulations and policy statements known as FIFRA, the Federal Insecticide, Fungicide and Rodenticide Act. Congress created FIFRA in 1947 to deal with the flood of post war chemicals and at the same time AAPCO, the American Association of Pesticide Control Officials (AAPCO.ceris.purdue.edu) was formed. AAPCO is a professional/lobbying organization composed mainly of state regulatory personnel. We'll hear more about AAPCO in a minute.

In 1970 Congress created the Environmental Protection Agency, and a primary responsibility of the EPA was to assure that the provisions of FIFRA were carried out. "Congress charged EPA with regulating pesticide use in a manner which will prevent unreasonable risk of pesticide exposure to man or the environment." (Federal Register/Rules and Regulations, Jan. 3, 1983)

In the mid-70s, in response to massive bee kills across the U.S., the standard bee caution was added to the labels of pesticides hazardous to bees – "...to prevent unreasonable risk..." With minor variations, the bee protection wording is "Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the area to be treated." Regardless of the smoke screens state regulators try to throw up (no pun intended), THE LABEL IS THE LAW, and label language put in place to protect bees is the LAW folks, Federal Law. Don't yield on that point and don't let them confuse you.

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"I'm glad to hear that about volume," Joe said. "The honey niche market won't ever get very big, 5-10-15%. And your second source?"

"Last year, Jack Thomas of Mann Lake, Ltd. urged a New York beekeepers' meeting to look at the coffee industry model on how to sell a niche product. He pointed out that before Starbucks and GMCR entered the scene, there was plain coffee, roasted and brewed to be "acceptable" to the "average" taste, in other words, a McCoffee. Along came the smaller roasters who said, Let's offer single bean roasts, at two and three times the price of the average cuppa joe – real coffee for a REAL price. And, as we all know, the public bought it, in great doses. They paid for quality. "Thomas told his listeners to stop *blending* an "acceptable" honey for the "average" consumer, and produce a premium product for a premium price.

"Are you perhaps proposing an alliance of smaller packers and producers," Joe asked suspiciously.

"Well, maybe not an alliance, maybe just a confederation of the smaller guys in each. Look, Joe, In some ways, the specialty honey producers have closer interests to some packers than to the producers. After all, many of them are producer-packers with a foot in both camps. If they just want to put honey in a barrel, then the big guys would speak for them, But if their business is trying to get added value from their honey, by definition, they're not in the bulk business. They are not trying to *undersell* anyone. On the contrary, they are trying to get *all* the money they can. They want to boost their own prices, not boost their competitors' prices through government action."

Silence from Joe. I kept writing.

"These smaller producers, even hobbyists understand that the customer is king/queen, that you have to *market* and *sell* the honey. It doesn't sell itself. Packaging isn't just clean barrels. It's not just meat and potatoes. It's filet, and beef tournedos and beef Wellington. Sure, to get into the big stores, they have to have bar codes and deal with slotting fees and in-time delivery. They have to think about cleanliness, shelf placement, appearance. They know they must sell when the customer is ready, not just when *they* are ready. They know they are competing with 30,000 other products for brain cells and spending money."

"Shelf space is the name of the game in selling any food product and you have to be BIG to command shelf space respect from stores. Kraft (et al) are 800# gorillas in this respect. If one of those giant food companies like Kraft got into honey they could create a demand (via advertising and shelf space) that would make the honey business profitable for a long time," said Joe. "From a pessimistic point of view, the down side would be that the gorilla would dictate honey prices to beekeepers. The optimistic view is that there would be such an overwhelming demand for honey (from megabucks spent on advertising) that honey prices should be quite good."

"Right now, the big packers are competing for the generic honey market. The monster groceries make the big guys compete against themselves with house brands and the like. As one packer told me, 'They let us into the store to beat up on.'"

"If you had a specialty honey association conven-

In the world of the EPA, the enforcement of pesticide laws is a "Delegated Program", in which the EPA confers enforcement responsibility, or "Primacy", typically to a state department of agriculture. This is accomplished through a "Cooperative Agreement", essentially a contract, which outlines what will be expected of the state. The EPA, however, remains responsible for seeing that the pesticide laws are properly implemented. They oversee the states to assure that the states have sufficient manpower, budget, facilities and training to satisfy the requirements of the Cooperative Agreement and they conduct an annual review of each state's performance. It looks good on paper, and in theory should work well in practice. Unfortunately reality falls far short of the ideal.

States have too often found pesticide laws to be burdensome and inconvenient, and consequently their enforcement has frequently been unenthusiastic or even substandard. Nowhere has this been more apparent than in enforcement of label restrictions to protect pollinators. In the past 25 years beekeepers have lost millions of dollars in uncompensated damages, and rarely has anything of consequence been done. Rather, states have most frequently avoided, evaded, quibbled, covered up, buried, prolonged, and whitewashed the investigation of bee kills, dragging things out until beekeepers gave up in frustration.

Through AAPCO states have repeatedly attempted to weaken and dilute the label restrictions on bees in the last few years, claiming that the language is too difficult to understand. More likely, bees are an irritant, an impediment to indiscriminant use of pesticides; the miner's canary, the sand in the ointment. Regulators don't like this because bee kills draw attention to pesticides and label restrictions limits their use, "...to prevent unreasonable risk of pesticide exposure to man or the environment" just as the law advises.

In 1997 AAPCO membership, through their president, petitioned the EPA to make the bee cautions ADVISORY. The EPA did not agree to this, not yet anyway, but apparently this hasn't prevented Minnesota regulators from introducing confusing statements into the current issue. This is a little like the head of the State Patrol petitioning the governor to make speed limits advisory. I suppose the regulators alone would decide when the law applied and when it didn't. There's a name for that kind of government.

In August of 1999 AAPCO held its summer meeting in Omaha, Nebraska and hosted EPA officials from the Office of Pesticide Programs. One item on the afternoon agenda was titled "Success Stories" from the states of Washington and Nebraska, to be followed by discussion of the bee hazard labeling.

The Washington success story was that the number of complaints about bee kills was down.

In Nebraska they had sprayed for grasshoppers and supposedly hadn't killed any bees.

It was left to the beekeepers in attendance to tell the EPA the rest of the story, which was that largely because of serious pesticide kills Washington had the lowest colony count since 1914, so of course the number of reported bee kills was down.

And in Nebraska the speaker failed to mention the state had lost 47% of its colonies in the preceding 8

tion," I said, warming to my You could have workshops on packaging, advertising, mail order, farmers' markets, grocery consolidation with its slotting fees and house brands, how to tie into the sustainable farming movement, selling through urban agriculture, taxes . . . besides all the normal happy stuff like mites and small hive beetles and resistant AFB. This stuff would also appeal to the serious hobbyists who wanted to make some real money from selling honey, not just fly under the I.R.S. radar."

"Eight hundred words on the page, and you're already planning a convention!" said Joe.

"Hey, this doesn't have to be a convention. It could be a couple of extra rooms at a meeting somewhere. It could be a couple of links on the NHB web site. It could be a newsletter, for goodness sake! The point is to get folks thinking."

"I don't know . . ." Joe said. "Will they go for it? Beekeepers may be too independent – you know, five beekeepers with seven opinions."

"Well, at least we tried."

"Have you talked to anyone else about this? I mean, this is a wacky idea!"

"No, that's why we're writing this article – to see if anyone bites."

"Oh," said Joe.

Bill Mares

Editor's Note: Somebody did bite. Preliminary plans are under discussion now for such an event at the 2004 EAS meeting in Pennsylvania. Watch this space.

years (a loss of 54,000 colonies between 1990 and 1998!), or that huge portions of the corn growing regions had been cleansed of beekeepers by Penncap-M abuse.

The EPA doesn't seem to take much notice of this kind of insurrection and spin-doctoring from the very people they have chosen to carry out the pesticide laws, and in fact their lax management only encourages it. In defense of the states, consider the Nebraska Experience. In December of 1994 Nebraska announced that because of massive bee kills it would not reregister Penncap-M in the state. Did the EPA support this courageous stand? Apparently not. Within weeks Nebraska had backed down, had discovered that Penncap-M was much safer than they thought and were suggesting as solutions the old tried and true dodges - charm school for beekeepers and sprayers, wind socks in the bee yards and similar nonsense. Most likely they were handed their heads by state legislators with narrow vision, and the EPA left them swinging in the wind, the law be damned. You won't see any more courage out of those people and you can bet that other states learned from Nebraska's experience as well.

Within the EPA, mid-level EPA operatives who might be inclined to do things right soon learn that they will not be supported by their upper management. Everyone is more interested in the next raise or promotion, and many remember that the next step up the career ladder may be out of the EPA and into one of those companies they may offend.

So where do beekeepers go with a mess like this, and it is a mess. It is a cozy, back scratching, seriously dysfunctional system long overdue for a thorough overhaul by Congress.

I suggest the following:

*Congressional Hearings – this goes far beyond Minnesota beekeepers. MN citizens are in an uproar right now over other abuses by the state and the same thing was going on in the state of WA in 1998.

*A Federal Beekeeper Indemnity Fund – financed through an assessment on those chemicals hazardous to bees. Beekeepers should be compensated in full for loss of property, loss of crop, and management time. If these chemicals are as safe as the manufactures would like us to believe, the demands on this fund should be small. Those who are profiting from these pesticides (not the taxpayers) should be the ones paying for whatever damage they cause.

*A truce between the two national beekeeping organizations, to work together on this problem.

Now may be the last chance beekeepers have to drive a stake in these pesticide problems. Honey prices are high and economic conditions are good. If you don't, in a few years it isn't going to matter how big your crop is, what the wholesale price is or how much you are getting for pollination, because pesticide problems like those going on in Minnesota will do you in. They've already had that effect on a lot of your friends, and there aren't many of you left as it is.

Fred Holte posed the question at the end of the article on spraying..." do we even have a right to exist?" Perhaps it's time for an answer.

Or maybe you can just sit back and the answer will come to you.

Tom Theobald

APRIL – REGIONAL HONEY PRICE REPORT

Other sales outlets that are popular include local, county and state fairs, feed stores, barber shops, meat outlets, meaderies, churches, the internet, mail order, high schools, and certainly at work.

Where is honey sold? In more places than you probably thought. Here's a list we sent out to our reporters, and their responses. The first column is percent of our reporters who sell at a particular location (i.e. 92% sell some honey out of their house). The second column represents the amount from all locations where honey is sold (i.e. 21% of all sales are made from the home by our reporters).

% of Rptrs	% of Sales	
92	21	Home (inside or roadside stand)
27	6	Local community sponsored farm market (i.e. Saturday & Sunday sales)
40	9	Local Farm Market business that's seasonal (Fall only, for instance)
24	5	Local Farm Market business that's year-round
12	3	Flea Market
39	9	Health Food/Organic store
29	7	Gift Store
15	3	Specialty Outlet (salons, tourist outlets, airports)
21	5	Bakeries/Food Establishments
13	3	Local High-End Retail Outlets (gourmet stores)
29	7	Local, Small 'Mom & Pop' Retail Outlets (grocery & gas)
5	1	Local, Small, Franchise Outlets (7-11, Dairy Mart, Stop & Go)
20	4	Local Small Packer or Producer/Packer
7	1	Large Packer, Regional, you deliver
12	3	Huge Packer, they pick up
13	3	Wholesale only to small/medium retail outlets (small chains)
20	4	Wholesale only to larger stores, you deliver
7	1	Wholesale only to large stores, delivered to warehouse (larger chains)
11	2	Breweries/Beer or Mead makers

*Total percentage of sales does not come out to 100% because of rounding errors.

	Reporting Regions												Summary		History	
	1	2	3	4	5	6	7	8	9	10	11	12			Last	Last
Extracted honey sold bulk to Packers or Processors													**Range**	**Avg.**	**Month**	**Yr.**
Wholesale Bulk																
55 gal. Light	1.36	1.50	1.27	1.30	1.40	1.50	1.34	1.19	1.29	1.50	1.30	1.37	1.19-1.50	1.36	1.32	0.73
55 gal. Amber	1.15	0.95	1.27	1.20	1.28	1.40	1.06	1.15	1.20	1.52	1.23	1.33	0.95-1.52	1.23	1.17	0.66
60# Light (retail)	88.67	85.43	92.83	85.00	85.10	86.00	98.63	90.00	112.50	93.00	120.00	97.00	85.00-120.00	94.51	90.58	71.51
60# Amber (retail)	87.50	80.69	90.00	80.83	88.88	79.50	98.60	88.33	95.00	95.00	110.00	85.17	79.50-110.00	89.96	84.34	67.92
Wholesale Case Lots																
1/2# 24's	37.42	32.58	38.12	33.69	38.00	33.00	35.46	38.12	42.00	31.93	25.00	39.53	25.00-42.00	35.40	32.83	29.07
1# 24's	59.89	43.46	48.00	46.19	48.56	51.00	51.78	54.00	52.48	57.70	58.90	62.82	43.46-62.82	52.90	53.15	45.46
2# 12's	50.69	38.84	47.00	44.17	49.97	51.50	47.09	52.44	51.20	53.68	47.00	54.27	38.84-54.27	48.99	47.90	40.88
12 oz. Plas. 24's	43.76	43.80	44.00	38.52	67.50	44.00	64.46	44.40	39.84	47.87	46.90	47.68	38.52-45.00	51.35	44.59	36.99
5# 6's	72.51	43.49	57.00	46.85	52.39	56.00	52.13	42.00	60.30	50.22	54.00	59.60	42.00-62.00	55.19	51.23	42.87
Quarts 12's (**NEW**)	59.83	72.12	69.00	62.81	73.39	70.67	73.35	67.60	78.00	73.98	80.70	82.50	59.83-82.50	72.00	70.09	
Pints 12's (**NEW**)	43.00	37.35	42.27	40.44	42.27	41.50	38.25	43.00	42.00	55.44	48.00	54.00	37.35-55.44	43.96	47.07	
Retail Honey Prices																
1/2#	2.25	1.90	1.51	7.21	1.69	3.10	2.14	2.56	2.00	3.45	3.12	2.48	1.51-4.95	2.78	2.29	1.81
12 oz. Plastic	2.73	2.63	2.95	2.79	3.10	2.43	2.61	2.93	3.31	3.06	3.23	3.49	2.43-4.55	2.94	2.94	2.35
1 lb. Glass	3.42	2.99	3.10	3.56	2.79	3.48	3.12	3.92	3.92	3.57	3.82	4.01	2.79-4.01	3.47	3.56	2.93
2 lb. Glass	5.89	4.81	5.10	5.99	5.99	7.25	5.48	5.16	7.05	6.25	5.13	6.72	4.81-7.25	5.90	5.67	4.41
Pint (**NEW**)	4.67	4.50	5.54	4.29	5.54	4.42	5.52	4.62	5.07	5.13	5.80	4.64	4.29-5.80	4.98	5.33	
Quart (**NEW**)	7.06	6.90	9.85	8.25	9.61	6.83	8.30	7.38	8.49	8.44	7.16	8.92	6.83-9.85	8.10	8.42	
5 lb. Glass	13.25	10.22	12.50	10.71	10.00	12.00	11.44	12.02	15.90	12.17	12.46	13.90	10.00-15.90	12.21	11.79	9.92
1# Cream	3.85	3.83	5.08	3.88	5.08	4.00	3.61	3.50	4.00	5.10	5.15	4.29	3.50-5.15	4.28	4.08	3.73
1# Comb	4.75	4.09	3.95	5.92	5.15	4.00	4.48	4.74	4.25	5.29	5.00	5.19	3.95-5.92	4.73	4.43	4.42
Ross Round	4.38	3.45	3.60	4.76	4.43	3.75	3.88	3.95	4.15	5.00	5.25	4.60	3.45-5.25	4.27	4.10	3.64
Wax (Light)	1.40	1.55	2.00	1.71	1.20	2.88	1.74	1.50	1.93	1.60	2.96	1.54	1.20-3.40	1.75	1.88	1.63
Wax (Dark)	1.78	1.60	1.75	1.53	1.10	1.23	1.18	1.20	1.00	1.36	1.89	1.00	1.00-3.78	1.55	1.95	1.37
Poll. Fee/Col.	44.00	41.00	40.00	36.50	27.50	37.50	40.14	40.00	41.22	46.00	55.00	41.40	27.50-55.00	40.85	39.27	38.53

2002 Honey Production

The Government Does It Again – How Much This Year?

Drought played the leading role in the honey show this year. Producers with five or more colonies counted by USDA for the 2002 crop could only muster 171 million pounds, down 8% from 2001. Overall, that's even worse than it looks. There were more colonies making (or trying to make) honey in 2002 than 2001. Not many mind you (18,000), but in 2001 that many boxes would have produced an additional 1.3 million pounds of honey. Not in 2002. Too dry in too many places.

There were 2,524,000 colonies reported last year, and 2,506,000 in 2001. That's everywhere. But it's the big operations, and the juiciest states that really matter. The top 10 producing states mustered up 1,800,000 colonies – 71% of the total. Not surprisingly, these same top 10 produced 70% of the honey crop. Even closer inspection shows the top five producing states putting 51% of this year's crop in barrels, doing so with 52% of all counted colonies. The message here is that if North Dakota, California, Florida, South Dakota and Minnesota have problems, the industry has problems.

A somewhat bigger picture comes to bear when looking at the whole U.S. The rule of thumb is that most of the bees are west of the Mississippi, and most of those who keep bees east. The numbers bear this out. 71% of all colonies reside in the West, Michigan, Wisconsin and Florida are the exceptions for top producers. Those western boxes produced, however, only 64% of the U.S. honey crop last year. Drought, as stated, was tough on bees and beekeepers.

Included on page 57 are the data for 2002 for colonies, production and value. Numbers tell the story. But to show the trend, we've included a decade's worth of data for the top 10 producing states for each year and their percent of U.S. colonies, and the percent of the U.S. honey crop they have been responsible for

For comparison we've included the top five producing states for each year also. The trend in colony numbers, though slow, is obvious. However, the amount of each year's crop is fairly stable. We suspect this reflects fewer colonies in the other 38 states each year, but the management of those is improving. BC

A Decade's Worth Of Data

1993-2002 Contribution To U.S. Honey Production by Top 5 and 10 States

	93	94	95	96	97	98	99	2000	2001	2003
TOP 10 STATES										
% U.S. Colonies	65%	65%	66%	65%	67%	67%	69%	69%	71%	71%
% U.S. Honey	72%	72%	72%	71%	71%	74%	73%	77%	70%	74%
TOP FIVE STATES										
% U.S. Colonies	47%	47%	48%	49%	48%	47%	50%	52%	52%	51%
% U.S. Honey	55%	53%	55%	54%	51%	57%	56%	60%	52%	55%

Honey Prices 1993-2002

Cents/lb.	93	94	95	96	97	98	99	2000	2001	2003
All Honey	53.9	52.8	68.5	87.8	75.7	65.5	60.1	59.7	70.4	128.6
Retail	81.3	89.1	100.0	117.3	125.7	114.7	126.6	130.4	142.2	145.4
%Difference	151%	169%	146%	134%	166%	175%	211%	218%	202%	113%

2001:2002 Comparison Data Top 10 States

	Colonies x 1,000		Production x 1,000 lbs.	
	2002	2001	2002	2001
ND	320	280	24,000	26,880
CA	440	425	23,320	27,625
FL	220	220	20,460	22,000
SD	225	235	11,475	15,275
MN	117	135	8,541	10,935
MT	134	136	8,442	13,872
TX	114	97	7,638	7,663
WI	70	67	6,650	5,427
NY	60	53	5,880	3,710
ID	100	100	5,700	4,600
Total Top 10	**1,800**	**1,748**	**122,106**	**137,987**
U.S. Total	**2,542**	**2,506**	**171,140**	**185,461**

U.S. Production '93 - '02

	lbs. x 1,000	#colonies x 1,000
93	230,655	2,876
94	217,168	2,770
95	210,437	2,684
96	198,095	2,566
97	196,536	2,631
98	220,311	2,633
99	205,228	2,688
00	220,339	2,634
01	185,461	2,506
02	171,140	2,524
Average	**205,537**	

Look at total honey production each year, and compare the amount to the number of colonies counted. Though there is variance each year in production, and a bumpy but predictable annual decline in colonies, the correlation is still above 80%. Weather, prices and number of operations in business still count, but not nearly as much as the number of boxes in the field.

See Entire Graph on Page 57

RESEARCH REVIEWED

Explaining • Defining • Using

Steve Sheppard

"Although not discussed in the paper, a question that comes to mind from this work is the possible apicultural use of such a brood pheromone."

The interactions that take place among individuals within a social insect colony represent fertile ground for study by experimental biologists. In the case of pollen collection and foraging activities of workers, we know that an individual's decision to forage is controlled by available colony stores, the genetics of the bees and the availability of pollen in the local environment. In research conducted at the University of California-Davis, Pankiw and colleagues (1998) demonstrated that honey bee brood itself produces a substance (called "brood pheromone") that increases pollen foraging activity of adult workers. These findings provide an answer to one of the long-standing questions about regulation of pollen collection and point the way for future studies.

In the Introduction to their paper, Pankiw and colleagues provide some background by presenting two hypotheses that have been proposed to explain the mechanism of pollen regulation in honey bees. One of these, the "indirect" or "brood food" mechanism, postulates that brood (and stored pollen) inhibit the further collection of pollen indirectly. This occurs through the influence of the nurse bees that, in the case of either a high level of pollen or a diminished level of brood, dispose of their excess brood food by feeding it to adult workers. The workers pass it around among the adult population through trophallaxis (food sharing) and, as a result, potential foragers for pollen are "inhibited" from pollen foraging for some time. A second hypothesis for regulation of pollen foraging is that stored pollen and brood may have direct effects on the foraging population. That is – the levels of brood or pollen somehow directly affect potential foraging bees. Pankiw and colleagues point out that both hypotheses predict pollen foraging will decrease in a colony when the amount of brood decreases or the amount of pollen stores increase, but for different reasons.

Pankiw et al set up two different experiments to test the direct vs indirect hypotheses. The first one was designed to determine whether brood had direct effects on foraging behavior. Previous work had suggested that a pheromone produced by the brood might stimulate adult foraging activity. The researchers washed sets of 500 larvae (2-4 days old) in 10 ml of hexane (a solvent) for one hour. This brood "extract" was poured on a glass plate (of a size equal to that occupied by 500 cells of worker larvae) and the solvent was allowed to evaporate. The plates thus represented 500 "larval equivalents" of pheromone when placed in experimental hives. Control plates were produced in the same way, with the use of hexane alone (no larvae extracted). Six small queenright colonies were alternately tested with 3 treatments: 1) brood pheromone (1000 larval equivalents = 2 glass plates w/extract), 2) brood (about 1000 larvae + 2 solvent treated control plates) and 3) broodless (no brood + 2 solvent treated control plates. The colonies were placed inside a large flight cage and provided with pollen and sucrose syrup feeding stations. Periodic observations were made at the feeding stations over a 6-hour period (9 minutes/hour) and foragers were marked at the stations to prevent recounting. Periodic entrance counts were made also to determine the type of load carried by foragers (pollen or non-pollen). The results of this experiment demonstrated that similar numbers of pollen foragers resulted from colonies containing brood-pheromone treatments or brood treatments, while the broodless colonies put forth significantly fewer pollen foragers. The authors concluded that these results clearly demonstrated a direct affect of brood on the foraging rate, because in the absence of actual brood, the pheromone alone was able to maintain a high level of pollen foraging. Stated another way – the results did not support the "indirect" effects of the nurse bees and distribution of excess brood food into the adult population to reduce foraging, because the amount of brood (none) was the same for both the broodless and brood pheromone treatments.

In the second experiment, the researchers compared the effect of brood alone to brood with supplemental brood pheromone. They again used 6 small queenright colonies and alternately subjected them to two treatments: 1) brood (about 1000 larvae + 4 solvent treated control plates) and brood + pheromone (about 1000 larvae + 2000 larval equivalents = 4 glass plates w/ extract). They found that the total number of foragers was significantly higher in the brood+pheromone treatment than in the brood treatment. The authors point out that the second experiment also supports the direct effects of brood on pollen foraging because the indirect hypothesis "predicts no difference

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RESEARCH ... Cont. From Pg. 15

between these colonies because they had the same quantities of stored pollen and the same amount of brood to feed" The difference was greatest during the first three hours of the experiment, when the brood+pheromone treatment colonies had about a 3 fold increase in pollen foragers compared to the brood treatment colonies.

The authors concluded that, while their experiments support a direct stimulus effect, they could not rule out the importance of nurse bees completely. For example, it may be possible that the nurse bees played a role in distributing the brood-produced pheromone to potential pollen foragers. They also pointed out that the pheromone from the glass plates diminished in activity after several hours and that this could be due the volatile nature of the active compounds or removal of the compounds from the glass plates by the bees themselves. The authors also presented data to show that the increase in pollen foragers was not due to immediate "switching" of nectar foragers to pollen foraging. Thus, the "hexane-extractable compounds associated with brood" (brood pheromone) appears to be specific for recruitment of additional pollen foraging. The authors point out that the mechanism whereby high levels of pollen itself can inhibit pollen foraging remains unknown. Thus, as with most scientific studies, this research answers some questions and, in describing the limits of its conclusions, also points the way for future studies.

Although not discussed in the paper, a question that comes to mind from this work is the possible apicultural use of such a brood pheromone. While the effects on foraging were short-lived (a matter of hours), what is the possibility that such a pheromone (or a synthetic analog) could be administered in a way to boost overall pollinating activity of colonies? Alternatively, perhaps a dose applied to colonies in the fall could stimulate pollen collection and bolster pollen stores for the bees' use in early spring. While these may be unlikely in the very near future, Pankiw and colleagues have provided us with an interesting study that points toward such possibilities. BC

Pankiw, T., R.E. Page Jr., M.K. Fondrk. 1998. *Brood pheromone stimulates pollen foraging in honey bees (*Apis mellifera*)*. Behavioral Ecology and Sociobiology. 44:193-198.

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Mark Winston

Not With My Own Eyes

"New Observations Upon Bees; Souvenirs Entomologiques; The Life of the Bee"

I have many passions. Country music from the old days back when Ernest Tubb, Bob Wills, and Loretta Lynn reigned over the airwaves still gets my heart a-pounding. Any movie about sports where the underdog wins moves me; the rumor that I cried at the end of the first Mighty Ducks movie is true. And as for anything chocolate, well I've been known to ask for seconds.

But my deepest kicks still come from a life-long fascination with good science, good writing, and of course bees. An elegant experiment, a well-turned phrase, a unique idea, these remain among my deepest pleasures. When combined with bees, my enthusiasm knows no bounds.

Thus, it was with great anticipation that I recently decided to go back and read some of the classic works about bees and insects by the great masters. Their books combined probing science and writing with the power and grace that has kept these works resonant with centuries of satisfied readers. I re-read Francois Huber's *New Observations Upon Bees* (1814), Jean Henri Fabre's *Souvenirs Entomologiques* (published as a series of short works from 1879 to 1907), and Maurice Maeterlinck's *The Life of the Bee* (1901).

I began with Huber, whose observations were compiled in an old-fashioned but refined format, as a series of letters. He added a preface when the letters were compiled into his book, and the first line is among the most startling in bee literature: "*In publishing my observations upon honeybees, I will not conceal the fact that it was not with my own eyes that I made them.*" Yes, Huber was blind, and his keen insights emerged with the assistance and partnership of his wife, Marie Aimée Lullin, and his servant Francoil Burnens, who carried out Huber's experiments and described the activities of his bees to this remarkable man.

Huber was born in 1750, in Geneva, Switzerland, and began losing his sight at the age of 15, soon becoming totally blind. Nevertheless, his contributions to our knowledge about bees, and to beekeeping, were formidable. He is credited with inventing the first movable frame hive, a glass-walled "Leaf Hive" designed like a book with frames that could be separated from the others for observations. This, combined with his suggestion that smoke could be used to pacify the bees prior to observations, allowed Huber to conduct experiments and observe behaviors through his sighted assistants.

The genesis of movable frame hives is expressed early on in Huber's work, in a series of back and forth letters to a Mr. Bonnet, who is not otherwise described by Huber but who made an observation that changed the course of bee biology and beekeeping. Huber had asked his assistants to watch bees through a glass window placed over comb, but noted that "*these hives are too wide, the bees building in them two rows of parallel combs, and consequently all that happens between those combs is lost for the observer.*" Bonnet suggested using narrower hives, with panes of glass close enough together that there would be room for only one row of combs.

Huber took that suggestion and devised his leaf hive which not only was the forerunner of the Langstroth hive, but as Huber put it: "*There are no cells which are not exposed to view, we are sure that they cannot conceal any of their actions.*" Using this hive, he went on to describe swarming with remarkable accuracy, confirm that the queen bee lays most of the eggs in a hive, and study how bees build cells and comb.

Reading Huber reminded me of how much we know about bees that must have been obscure to beekeepers and naturalists until comparatively recently. For example, it is common knowledge today that the old queen is the one that leaves with a swarm to establish the new nest, but how and when did that information become part of our bee lore? Huber figured it out: "On examination of all the bees of the swarm, we became convinced that it had been led by the old queen, the one which we had made easy to recognize by the deprivation of one of her antennae."

He also described what happens before and during swarming: "*On the 13th, the queen's belly appeared to us to be more slender, but she still laid some eggs We also surprised her this day, at the moment when she was laying in one of the royal cells. She first dislodged the worker employed there by pushing her away with her head, then after having examined the bottom, she introduced her belly into it, by supporting herself with her anterior legs on one of the adjoin-*

Continued on Next Page

"Mostly, though, these guys were great writers, merging exquisite science, profound thinking, and endless hours in their beeyards into a timeless legacy for us to enjoy and ponder."

ing cells On the 15th, the queen appeared still more slender, the bees continued to care for the royal cells, which were unequally advanced, thus proving that the queen had not laid in all those cells at the same date."

A pretty remarkable set of observations. Huber discovered that the queen slimmed down before swarming and laid the eggs in the queen cells, the workers tended them, preparations for swarming included various-aged queen cells, and the old queen left with the swarm. These findings have been the basis of bee management and science for over 300 years, during which we have built on the foundations established by this talented scientist and writer. Note also Huber's use of "we;" he taught us the importance of collaboration at the earliest stages of modern bee science.

The French naturalist Jean Henri Fabre also was handicapped, in his case by the poverty of his parents and the scorn of the academic community for this lover of insects and popularizer of science. He had to work from childhood to augment his family's income, selling lemons and keeping ducks to help make ends meet. He was a bit of a dreamer, and always made time during his labors to observe closely the natural world around him. Eventually he won a scholarship to college, and then embarked on a career as a lecturer at a teacher's college in Avignon, France.

His career soon turned sour, however, as some colleagues viewed his ideas that girls should be taught science as subversive. Others victimized Fabre by sabotaging his research and stealing his ideas. Eventually, he and his family were driven from Avignon by the ridicule of Fabre's co-workers.

He was rescued by the English philosopher John Stuart Mill, who had met Fabre in Avignon and accompanied him on walks through the countryside. Mill sent Fabre enough funds to allow him to move to Orange, where he embarked on a writing career that brought him a small income but still scant recognition from the scientific community. He eventually developed a modest public following, one that grew and deepened after his death in 1915.

Fabre's interest in bees was primarily in their role as prey. The ecological and behavioral aspects of predation fascinated him, and evoked some of his starkest writing. He wrote of the bee-killing wasp *Philanthus*: "*It kills its bee instead of paralysing it. Once having committed the murder, it does not release the bee for a moment I see it squeezing the bee's stomach, compressing it with its own abdomen, crushing it as if in a vice I am far from denying that Philanthus has honest methods of earning a living, peacefully drinking their cups of nectar, but they live by piracy as well.*"

He had similarly rough words for crab spiders: "*This cutter of bees' throats is a pretty creature despite an unwieldy paunch fashioned like a squat pyramid and embossed on the base of either side with a pimple shaped like a camel's hump. They are passionately addicted to the pursuit of the domestic bee. This murderess of the bee is of a chilly constitution the thug has struck her blow; she is draining the blood of the departed.*"

Maurice Maeterlinck (1862-1949) was the last of this trio of masters writing about bees, but he was not a scientist. A Belgian who was better known as a playwright and poet, Maeterlinck was honored in 1911 with the Nobel Prize for Literature. His literary work was known for highlighting man's spirituality, stressing the emotional over the intellectual, but also emphasizing that we each create our own destinies.

The speech presenting him to the Swedish Academy Nobel Prize audience focused mostly on these achievements, but Maeterlinck also was a beekeeper who drew profound lessons from his bees about life and human nature. The section of the Nobel citation that focused on his book *La Vie Des Abeilles (The Life of Bees)* said in part: "*His book is not an abstract of natural history but an exuberantly poetic work abounding in reflections It is useless, the author seems to say, to inquire if the strange cooperation among the bees, their apportionment of work, and their social life are the product of a reasoning mind. It matters little whether the term instinct or the term intelligence is used, for they are but ways of revealing our ignorance in the matter. What we call instinct among the bees is perhaps of a cosmic nature, the emanation of a universal soul.*"

The work of these three different but equally extraordinary individuals was replete with good beekeeping, brilliant experimental designs, clever methods, and keen observations. A deep river of poetry and philosophical musings about bees, humans, and nature also flowed beneath their more pragmatic science.

Mostly, though, these guys were great writers, merging exquisite science, profound thinking, and endless hours in their beeyards into a timeless legacy for us to enjoy and ponder

Pick up one of their books, head out to your apiary on a warm spring day, and enjoy You'll find the experience even better than chocolate. **BC**

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Cracking The Honey Bee's Genetic Code

Malcolm T Sanford

"Though phylogenetically distant, honey bees live in societies that rival our own in complexity, internal cohesion, and success in dealing with the myriad challenges posed by social life, including those related to communication, aging, social dysfunction and infectious disease."

One cannot escape ubiquitous references to DNA in today's information age. These three letters are everywhere and the substance they stand for is touted to be responsible for everything from determining the remains of long lost relatives to solving crimes. Perhaps the most significant effect of DNA analysis so far is the release of all prisoners on death row in Illinois by outgoing governor George Ryan.[1] Another controversial topic surrounding DNA is the rise of genetically modified organisms or GMOs. Depending on who one listens to, development of these organisms is expected be responsible for a wide variety of effects from solving the world's hunger problem to becoming ultimate pollutants that will destroy agriculture as we know it.[2]

DNA stands for the chemical compound deoxyribonucleic acid. The structure of DNA was first described in 1953 by James Watson and Francis Crick in the Journal *Nature*.[3] They characterized the structure as a double helix; two paired strands held together by four specific molecules, called paired bases. The paired bases are like stair steps that are enclosed in a spiraling staircase molecule. DNA is not only a molecule, it also is information because the order or sequence in which the bases are found determine how organisms produce proteins from the body's building blocks called amino acids.[4] Another way of looking at this is that the paired bases are letters making up sentences that in their entirety is the language for how an organism operates, its genetic code.

Ever since language arose, humans have been involved in cracking code, determining the real meaning of first symbols and then words. Perhaps the most dramatic examples are those associated with World War II. The allies coming into possession of the German code books gave them a great advantage in winning the conflict. In the pacific, "code talkers" were employed. Since the Japanese could listen to radios and find out what English-speaking troops were planning, Navajo-speaking American Indians were employed to send messages back and forth. Perhaps the most famous code up until now was that developed by Morse that drove the telegraph before voice could be transmitted through wires.[5]

With discovery of the structure of the informational molecule DNA, the genetic code of organisms, indeed all of life on planet earth, can now be cracked. This is a huge task, but is becoming easier with the development of powerful digital computers. Recently the human code, called the genome, was deciphered in total, some three billion base pairs or letters.[6,7] Others on the fast track include the chicken (*Gallus gallus*), chimpanzee (*Pan troglodytes*), dog (*Canis familiaris*) and kangaroo (*Macropus species*). Insects are also on list including the silkworm (*Bombyx mori*) and the honey bee (*Apis mellifera*).[8]

A consortium of scientists and others led by Dr. Gene Robinson at the University of Illinois, Urbana-Champaign have developed a honey bee genome proposal, which was given high priority and has been funded.[9] Sequencing of the estimated 16,000 genes began December 13, 2002 and is expected to be complete sometime in the Spring of 2003. The trace archive shows the raw information as it is submitted to the National Center for Biotechnology Information.[10] Dr. Jay Evans,

[1] American Civil Liberties Union World Wide Web Page, accessed February 14, 2003 < http://www.aclu.org/DeathPenalty/DeathPenaltymain.cfm?ContentStyle=1>

[2] Fred Hutchinson Cancer Research Center World Wide Web Page, accessed February 14, 2003 www.fhcrc.org/education/hutchlab/links/gmo.html

[3] LionBook World Wide Web Site, accessed February biocrs.biomed.brown.edu/Books/Chapters/Ch%208/DH-Paper.html

[4] DNA Double Helix- Information Code World Wide Web page, accessed February 14, 2003 www.dna-double-helix.net/

[5] W1TP TELEGRAPH & SCIENTIFIC INSTRUMENT MUSEUMS World Wide Web Page, accessed February 14, 2003 w1tp.com

[6] Human Genome Project Information World Wide Web page, accessed, February www.ornl.gov/hgmis/

[7] National Human Genome Research Insitute World Wide Web page, accessed February 14, 2003 www.genome.gov/page.cfm?pageID=10002154

[8] *New Scientist*, The Global Science and Technology Weekly, December 2002, p. 44.

[9] Honey Bee Genome Sequencing Proposal World Wide Web page, accessed February 14, 2003 www.genome.gov/Pages/Research/Sequencing/SeqProposals/HoneyBee_Genome.pdf

[10] National Center for Biotechnology Information World Wide Web page, accessed February 14, 2003 www.ncbi.nlm.nih.gov/Traces/trace.cgi?

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GENETIC ... Cont. From Pg. 19

who just was nominated "Outstanding Early Career Scientist of 2002" by the Agricultural Research Service (ARS), the chief scientific research agency of the U.S. Department of Agriculture, heads up the Beenome World Wide web home page, which has the goal of summarizing and presenting new genetic data from honey bees in a timely fashion.[11]

This is not a trivial pursuit. The Consortium estimates it will take four months and cost $7 million, involving 350 laboratories and 1500 scientists. The results of this project are expected to be substantial in terms of both human and insect health. In addition, this is the first social organism to be sequenced and special benefits are expected from this particular situation.

The proposal says, "*Homo sapiens* (humanity) is a highly social species and social interactions are critical determinants of human mental and physical health. We propose to sequence the genome of another highly social species, the honey bee, *Apis mellifera*. Though phylogenetically distant, honey bees live in societies that rival our own in complexity, internal cohesion, and success in dealing with the myriad challenges posed by social life, including those related to communication, aging, social dysfunction and infectious disease. A honey bee genome sequencing project (HBGP) will benefit human health and medicine in diverse areas, including venom toxicology, allergic disease, mental illness, infectious disease, parasitology and gerontology. In addition, the HBGP will improve human nutrition by enabling enhanced pollination of food plants and accelerated delivery of hymenopteran parasitoids for biological control of pests. The HBGP will also improve honey bee sentinel function, providing enhanced capabilities for detection and location of chemical and biological agents of harm. Sequencing the genome of the honey bee, a beneficial, non-dipteran, insect endowed with a small brain but cognitive sophistication, with complex social organization but amenable to molecular, genetic, neural, and ecological manipulation, will provide important tools and unique models to improve human health. When these benefits are balanced against the costs of sequencing a 270MB genome, the HBGP promises to provide a valuable and economical resource."

Specifically, the Consortium expects the following areas to benefit from the HBGP (edited by this author but mostly in the words of those who wrote the proposal):

Novel antibiotics. Increased drug resistance by pathogenic bacteria has created an urgent demand for new antibiotics. Insects are among the more promising sources of novel antibiotics and honey bees likely offer a rich source because of their sociality. Like humans, honey bees live in a social environment with nearly ideal conditions for growth and transmission of pathogens. Food is constantly shared among individuals, the beehive is maintained at a temperature of 33°C (93°F) and 95% relative humidity, and population densities are mind-boggling (as many as 50,000 adults and 50,000 juveniles at densities equivalent to ca. 15 adult humans in a 6 x 4 m apartment). Although afflicted with many diseases, honey bees must have evolved many powerful antibacterial peptides to cope with the huge number of pathogens that would thrive in such conditions. Interest in this topic is increasing, but a HBGP is necessary for efficient genomic bio-prospecting.

Infectious disease. Humans show both antigen-specific and innate immune responses to important pathogens including *Mycobacterium tuberculosis* and *Streptococcus pneumoniae*. Better understanding of innate immunity can help counter these diseases, especially when vaccines have limited effectiveness. Non-human models, especially insects, are very useful; immunity is phylogenetically ancient, and defensive strategies are highly conserved at the molecular level. "Community genomics" promises to provide new epidemiological and mechanistic insights into human infectious diseases. *A* HBGP also will provide information on parasite resistance, as the DNA source for the HBGP is a strain resistant to *Varroa destructor*, a serious bee parasite. This selected bee strain suppresses *Varroa* reproduction via as yet unknown mechanisms.

Bee venom, anaphylaxis and human allergic disease. Honey bees defend their hive aggressively with both sophisticated behavioral and biochemical mechanisms. Bee venom has a wide range of medically important and pharmacologically active compounds. Several of them already have been identified, notably melittin and apamin, with outstanding therapeutic potential for cancer, sleep disorders, learning and memory enhancement, Parkinson's disease, HIV and AIDS associated dementia, schizophrenia, and novel non-viral vector development for gene therapy. But other venom components remain to be identified. Because honey bees have had intense evolutionary pressure from mammalian predators, it is likely that bee venom contains other compounds with similar human therapeutic potential.

Nutrition. Honey bees are the premier beneficial insect worldwide. While best known for honey, the honey bee's more critical contribution to human nutrition is crop pollination, valued at nearly $15 billion/year in the U.S. Pollination increases the quantity and quality of fruits, nuts, and seeds, many of them increasingly recognized as sources of nutraceuticals. But parasites and pathogens compromise bee health and pollination activities. Adding to the problem, exotic parasites have decimated feral honey bees, and increasing insecticide use and ecosystem disturbance have reduced native pollinator populations. These problems threaten to decrease insect pollination and reduce food quantity and quality. A HBGP will help to breed bees that resist disease and insecticides, pollinate more efficiently, but sting less.

Mental health. Some forms of mental illness, such as autism, involve problems with social integration. The basics of how individuals respond to their social environment (sensory structures, signal transduction cascades, various forms of neural plasticity) are highly con-

[11] The Beenome World Wide Web home page, accessed February 14, 2003 www.barc.usda.gov/psi/brl/beenome.html

served across phyla. Bees show a high degree of social integration, and their activities are highly dependent upon their ability to read social cues; identification of several well-defined sets of social cues make for unusually tractable experimental social systems. Combined with a HBGP and the highest known genetic recombination rate of any animal, this provides the platform for mapping complex behavioral traits, including those related to social integration.

Biosensors. A HBGP also may enhance use of honey bees as environmental sentinels. Honey bees evolved as efficient explorers, canvassing and exploiting areas of several square miles around their hive. As such, honey bees function as a comprehensive array of autonomous biosensors, capable of reporting the presence, location and concentration of environmental toxins. Preliminary evidence suggests bees can be trained to locate substances used in various types of warfare, and bees have been deployed in ongoing DARPA research to detect biological and chemical weapons. These security-related activities might be aided by "tuning" bee detection capabilities with information obtained from the identification of genes involved in olfaction, e.g., olfactory receptor genes, which are very difficult to find without extensive genome sequence information due to rapid evolutionary sequence divergence.

X chromosome diseases. Mutations on the X-chromosome are responsible for many serious conditions, including Turner's syndrome, Trisomy-X, Kleinfelter's syndrome, hemophilia, colorblindness, and fragile-X syndrome, the leading cause of mental retardation. These are thought to be due in part to unique features of X chromosome biology, among them the demands of dosage compensation and sex determination. Honey bees are "haplo-diploid;" in a sense, each bee chromosome is an X-chromosome, i.e., one copy in the male and two copies in the female. A HBGP will enable comparative analyses to address questions such as: What control regions are important in gene expression, sexual development, and dosage compensation on the X? What role, if any, do orthologs of dosage compensation and DNA repair genes play in a haplo-diploid? No haplo-diploid animal has yet been sequenced.

Instincts. The societies of honey bees and other social insects occupy Wilson's second "pinnacle of social evolution," with complexity that rivals our own. Among the provocative similarities are: extensive communication systems (including the only non-primate symbolic language); highly organized defense and warfare; complex architecture (including the insect equivalent of skyscrapers – 4 meter high termite nests in Africa); and expressions of personal sacrifice unheard of in most of the rest of the animal kingdom. Many of these traits are instincts or have strong instinctual components, suggesting that it should be possible to identify genes in humans that are involved in similar traits. In bees these traits are amenable to experimental molecular analysis; the full range of behavioral maturation unfolds in a lifespan of about one month and the natural social environment can be manipulated extensively

Cognition. Bees collect food from flowers, a highly ephemeral food source, and have evolved sophisticated cognitive abilities to maximize foraging success. They are excellent at associative learning, based on the need to associate a color, shape, scent, or location with a food reward. Honey bees also can learn abstract concepts such as "similar" and "dissimilar," and are able to negotiate complex mazes by using visual stimuli as direct or abstract "signposts" or by recognizing path irregularities.

Gerontology. Queens and their workers have identical genotypes but queens live two orders of magnitude longer. Identification of all differentially expressed genes responsible for these striking differences in lifespan, facilitated by a HBGP, undoubtedly has important implications for human longevity and aging.

Other areas include determining gene regulation, providing a better connection between human and non-human genetic sequences, and expanding understanding of developmental biology, neurobiology, and complex systems analysis.

Finally, there is the possibility of better understanding evolutionary processes. As the Consortium concludes in its document: "Altruism is the social glue, the trait that enables a complex society to evolve and function. But altruism has long been an evolutionary enigma, inconsistent with basic Darwinian theory. This is seen in its starkest form in the insect societies: Most members spend their lives helping the queen to reproduce rather than increase their direct fitness by generating their own progeny. Efforts to solve this puzzle have had profound effects. They have led to the development of many of the most widely accepted theories of social evolution in all organisms, including humans, i.e., kin selection and reciprocal altruism, and have spawned 'evolutionary psychology,' a controversial subdiscipline that assumes that aspects of human sociality are evolved traits, and therefore have biological bases. Molecular analyses of bee social behavior can contribute to our understanding of social evolution. While ants and termites are all highly social, there are bee species that span the range of possible social phenotypes from solitary to primitively social and on up to those with the most advanced societies. In addition, within the Order Hymenoptera (ants, bees, and wasps), it is estimated that sociality evolved independently at least 11 times. A comparative genomic approach, spearheaded by a HBGP, can use these natural experiments to gain insights into the molecular basis of sociality."

Given the points made above about the benefits, it is easy to see why many in both the beekeeping and lay community await the results of Honey Bee Genome Sequencing Project with great enthusiasm. Some of this must be tempered, however, with the knowledge that the honey bee has often proven to be an enigma to beekeepers who would attempt to manage such a complex, social insect. It is suggested, therefore, that we humans in an effort to crack the honey bee's genetic code do so with a good deal more humility than hubris. **BC**

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Seasonal Colony Survival Traits

Walt Wright

An effort was made in earlier articles to introduce you to the concepts of changing activities in the honey bee colony. Activities change with season advancement for the whole year. The example of simpler insect lifestyles was used to point out that activity changes are not unique to the honey bee. However, the complexities of the social insect lifestyle of the honey bee require more sophisticated changes in internal operations, and more of them.

The internal operations to be described herein are those seen on the Alabama/Tennessee state line, about the center of both states. The activities will be summarized for our calendar season. Further north, where the active season is compressed, the monthly entries would also be compressed.

The descriptions below are provided for the full calendar year. As noted in an earlier article, the honey bee colony development schedule is synchronized to the growing season of deciduous native trees. All the popular races of European bees react to the season advancement with very close timing. Variations between the Italian and Carniolan are minimal. The different races read season advancement within a few days of each other when compared colony to colony.

It should be noted that some of the year-long operational changes have been discussed in earlier articles to support other survival traits. They will be included in this list again to provide a January to January running list.

JANUARY Brood rearing. It appears that the Winter brood rearing is an operational part of wintering. The colony starts brood rearing to offset the cluster decline in size resulting from loss of last season's bees. The cluster volume does not typically show an increase until emergence of the second brood cycle in February.

FEBRUARY Start rearing, or make provision for rearing, large numbers of drones. The impending mating season dictates rearing of drones well before the swarming season. It takes substantially more time to get a mature drone on the wing for mating than the development time for a queen.

MARCH The swarm preparation season starts in March, locally. The operational changes related to swarm preparations will be treated separately in another article. For this year-long summary, it will be sufficient to note that March is the period of population "explosion" to support reproductive swarming by colony division.

APRIL Locally, the month of April is jam-packed with operational changes. It is the month of reproductive swarm issue. But since we intend to treat swarm operational changes separately, we will note changes of the colony that is not strong enough to swarm.

In the first week of April, concurrent with the beginning of hardwood leaf-out, the colony that has not started swarm queen cells abandons reproductive ambition. We refer to this change of objectives as the reproductive swarm cut-off. (Repro c/o)

The colony decision to abandon reproductive swarm ambition produces several indications of internal operational change. Some are more apparent to the beekeeper than others. All colonies do not exhibit all of the following indications, but all colonies will typically show two or more indications of change.

1. All established colonies start a slow-down in overhead nectar storage. Very little, if any, nectar is added in the supers in spite of woodland sources peaking during the period. The storage lull lasts about three weeks and ends with the appearance of white wax at the start of the main flow. The break in storage is the period between the literature's "early flow" and "main flow." The lull is an operational change effect internal to the colony, and has nothing to do with field nectar availability. Second year colonies that have retained establishment momentum over the Winter often display the opposite indication. They are suddenly storing a solid pattern in three empty supers at the same time.
2. Barring overcrowded conditions, any queens cells started after reproductive cut off will be supersedure queens. Some colonies will start supersedure promptly after the decision to abandon swarm ambition and others will start between that time and early in the main flow. Our judgment of swarm

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versus supersedure cells is as follows: Fewer than seven cells on any given level indicates supersedure; more than 10 represents swarm intent; between seven and 10 is seldom seen at this location.

3. Some colonies generate some wax makers in the prime swarm prep period immediately prior to reproductive cut off, whether they have intent to swarm or not. With cancellation of swarm ambition, their wax will not be needed for building comb in a new location. With the operational change at reproductive cut off they need to graduate to foragers. They will deposit their wax holdings in the first few days after the decision is made. If the colony was feeding on darker Fall honey or early season darker nectar, when they tanked up for the wax making, the wax will not be white. The off-colored wax is most often stored in the brood nest as burr comb or bridging. A new wave of wax makers will be generated for the white wax "main flow."

4. The last indication to be described can be seen by the beekeeper rather easily if he knows when to look for it. The reserve of capped honey saved through the swarm season above or to the sides of the brood nest has served its purpose. After reproductive cut off, the colony is as eager to consume it as they were to protect it a few days earlier. They feed on the reserve even though field nectar is peaking. We conclude from the indications that they desire to recycle those cells with this season's fresh nectar. The capped honey reserve will be more fully described when swarm preparation operational changes are discussed.

About mid April, the colony that was expanding the brood nest to increase population for swarming changes direction. After a delay of a week or so from reproductive cut off, the colony starts brood nest size reduction. The brood nest size is reduced from that point through the main flow until it is down to the size that just produces replacement bees. Brood nest reduction is accomplished by displacing brood with nectar at the top, and pollen at the bottom.

In the last few days of April, the white wax "main flow" starts. There is no immediate gain in the supers. The early "main flow" incoming nectar and new wax are applied to brood nest reduction. The lull lasts for approximately three weeks, and is interesting from the standpoint of that period being a worker brood cycle. It is also interesting that black locust blooms during that period. In years when black locust is good here, there is no gain in the supers. The bees work it to support brood rearing only.

MAY AND EARLY JUNE This is the honey production period when the colony adds stored honey above the receding brood nest. They will fill supers at rates limited only by available work force and forage in the field. Brood nest reduction continues.

LATE JUNE – EARLY AUGUST At this location, with a split season, midsummer/native forage sources are erratic to nonexistent. The bees are operating in a stand-by mode. In this mode, the bulk of bees are fairly quiescent to conserve stores. They have met survival requirements on the "main flow." Most colonies are content to only forage for Winter stores maintenance. That is – they like supplement stores used for brood rearing and feed during the period.

We suspect that in the extended forest of their ancestors, where Fall forage was minimal, the colony would stay in the stand-by mode all the way to Fall broodnest closeout. Having their cavity filled with stores and the brood nest reduced, there would be little reason to do otherwise.

LATE AUGUST/SEPTEMBER When the sustained increase in field forage is perceived by the colony, an increase in brood volume is triggered. The colony keys on field forage. They build population to take advantage of forage availability. In this area, building population is a wintering advantage. There are more young bees for wintering.

OCTOBER Operational changes in the Fall are recognized in the literature. The colony closes out brood rearing for the year. The colony that gets it right has all the brood emerged in time to fill brood cells with nectar. If brood cells are vacated while field nectar is available, the whole cavity (hive) can be filled with Winter stores. In this area, most colonies are successful in this preparation of the Winter broodnest. In more northerly locations, where Winter descends more rapidly, the beekeeper may be forced to feed in the Fall.

The other operational change is the termination of drones. To prevent the drone burden on Winter resources, the drones are banished.

NOVEMBER-DECEMBER The early clustering period is dedicated to stores conservation. Without brood rearing, cluster temperatures are permitted to drift lower. The key feature of this period is overall reduced activity, resulting in less stores consumption. What little honey is consumed in the center of the cluster frees up cells for mid Winter brood rearing (and clustering).

The literature could be interpreted to reflect that the honey bee colony is just waiting for forage to show up on the horizon. If they make the mistake of over population, a swarm is generated. These oversimplifications couldn't be further from the truth. The colony is protecting existing colony survival for the full year. When the experts recognize the seasonal changes in colony internal operations, we can all see beekeeping from a different perspective. BC

Walt Wright is a sideline beekeeper and enthusiastic experimenter, who lives in Elkton, Tennessee.

Past Pieces

Smoking Bees: Before The Bellows

Wyatt Mangum

Sometimes history comes to life, and one becomes immersed in it. I remember such an encounter in Northern India, in the foothills of the great Himalayan Mountains, a land of spectacular scenery and ancient beekeeping. Driving along the twisting nail-biting roads chiseled into mountain cliffs and, when the roads ran out, trudging up steep paths, we made our way to numerous villages to visit beekeepers and inspect their colonies.

In this distant land many things were different. Here the bees were not *Apis mellifera*, the bee we have in North America, but rather the Asian hive bee, *Apis cerana*. And

Inspecting a wall hive without smoke or a veil. The hive cavity was in a mud wall, which was painted in this house. Although the room was actually dark, the burst of the camera flash lit it up, but just for a split second.

most remarkably, the traditional method of beekeeping was not at outside apiaries, but rather with colonies residing in the thick walls of the beekeeper's house. A typical house, made mostly of wood, had interior walls finished in a smooth layer of dried mud. Behind a board plastered in the wall with mud was a small cavity, about the size of two loaves of bread. The bees lived in this cavity, building their combs without frames or foundation. With a small entrance to the outside and access to the hive only from within the house, the bees were safe from theft and predators. This kind of hive is called a wall hive, and this old method of beekeeping is rarely seen by westerners.

In stark contrast to visiting a beekeeper's apiary, to open a wall hive one usually needs to enter the beekeeper's intimate living space, especially since the hive may even be in a bedroom wall. On many colony inspections, I sat on the beekeeper's bed surrounded by a few treasured pictures of family members and other things of sentimental value. The rooms were small, cramped and dark since many houses lacked electricity. So with a small flashlight, I inspected the bees.

Most colonies were gentle and did not require smoke. However, the first irritable one provided me with a unique experience and was definitely worth the stings, even though getting stung in the dark is just plain miserable. Like calling in the heavy artillery, I asked my companions to light a smoker, imagining they would get my big trusty smoker from my pack, a smoker that has even protected me from Africanized bees in Bolivia. But to my disbelief, what they handed me in that dark little room was not my beloved smoker, but rather a thick rope-like cord with a smoldering ember on one end, giving rise to only a tiny, delicate, trail of smoke.

And now comes the revelation. Although I knew I was working with an ancient form of beekeeping, the stings catapulted my mind forward hundreds of years. I wanted my modern smoker! But a calming bit of wisdom came over me. Part of being immersed in this beekeeping of the past is to control the bees with a method from the past. I heeded that advice, and holding the smoldering end of the cord near my mouth and close to the irritated bees, I gently blew, wafting a small bit of smoke over them. Instantly the bees ran away, vigorously fanning their wings in defiance.

With practice, smoking the bees in this fashion became quite natural, making that instinctive desire for my big smoker seem somewhat odd and even humorous. What was I thinking? Even if used sparingly, that volcanic beast would have quickly filled the room with smoke, forcing me to withdraw to fresh air. Not a pleasant state of affairs when you are on the other side of the world. Yet for me there was a subtle and deeper lesson to learn. I doubt our modern smoker could have ever developed in this beekeeping environment, because this is a rare situation where it's not practical. A simple smoldering cord, giving a just bit of smoke, works better (in a room) than a bellowed smoker de-

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A smudge pot bee smoker. Note the handle for carrying the pot well above the heat of the fire. The small hook at the top of the can attached the smoker to an open hive. Lower down, a small metal loop kept the can from scorching the hive. This smudge pot smoker was found with other beekeeping equipment stored since the 1880s, an incredibly rare find.

signed to produce large volumes of smoke (outdoors). (Interestingly, I have adopted their method of smoking bees with a cord in my bee house, which holds 30 observation hives for research.)

However looking back in history, especially in North America and to some extent in Europe, beekeepers have long sought a smoker that was practical and reliable with smoke that could be easily directed towards the bees. Before the advent of such a smoker, controlling bees could be difficult, especially since some stocks were quick to sting. Working those bees without a good smoker must have been miserable, prompting ingenious beekeepers to try various devices.

A. I. Root, writing in the *ABC of Bee Culture* from 1888, described a corn-popper smoker. This device was a wire basket on a handle. The basket was filled with smoldering wood and the wire lid was closed. After whipping the basket around several times, it would make a generous amount of smoke. With the basket held over the frames, the beekeeper would have to direct the smoke downward by blowing on the basket. The device was awkward to use, and one could easily get a painful dose of smoke in the eyes.

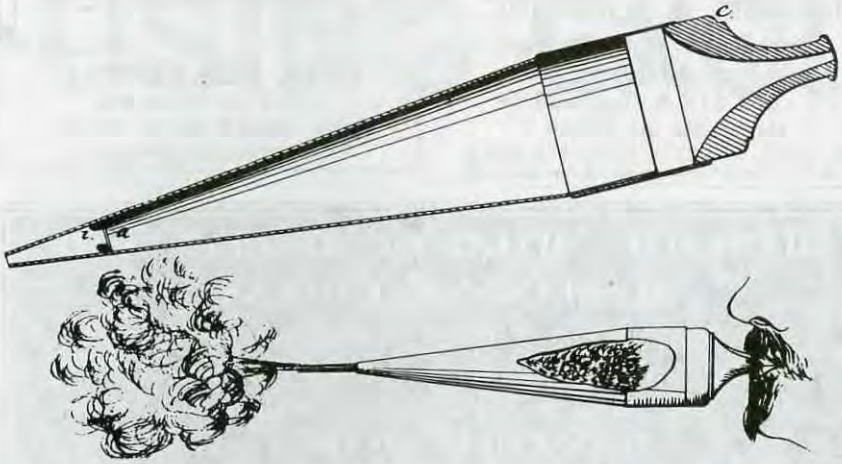
Some people used a smudge pot hooked on the windward side of the hive. (I even managed to find an old smudge pot smoker.) Although one could easily keep the smudge pot lit, directing the smoke was problematic since it depended on the fickle direction of the wind. In addition, the bees would fall into the pot and perish in the flames. This disturbing defect was remedied by covering the pot with a screen.

The next photo shows an extremely rare smoker resembling, strangely enough, a small four-legged animal. The fire resided in its belly, and it is refueled through a little door in its back. The smoke comes out the long thin nose-like tube. Now for the burning question. How was this device used to smoke bees? Of course as soon as the smoke came out of the tube it would rise. So holding the smoker horizontally with the tube over the top bars, the smoke goes up instead of down on the bees. Does the beekeeper have to blow on the smoke to make it go down? Or maybe you just tip the head end of the smoker down, but then the rear end is higher, and the smoke goes that way, still in the wrong direction.

The problem here is that the attempted analysis suffers from a modern entrenched mind set. It assumes the smoker was used on a standard top-opening Langstroth hive. In the study of apicultural history, such mindsets are crippling. In fact, this smoker was not designed for use with a top-opening hive, but rather with a rear-opening Harbison hive, a hive from about the early 1860s.

In stark contrast to these big smudge-pot style smokers are small delicate devices held in the mouth. The *ABC of Bee Culture* (same edition as above) describes a tin-tube smoker. It was made from a tube

The smoker positioned at a Harbison hive. The smoke would rise and control the bees. The end bars of the brood frames are in the lower part of the hive. The square boxes above them are racks of two-pound comb honey section boxes, a style of honey production popular at the time.



This smoking device was held in the mouth, keeping the hands free to work the bees.

about eight inches long and one and a half inches in diameter. The tube could be packed with cotton rags, tobacco, or rotten wood. The ends of the tube were closed with wooden plugs, each provided with a small hole. One plug was shaped so that the tube could be held in the mouth. Once lit, the beekeeper could direct small amounts of smoke on the bees by blowing in the tube. With the smoker in the mouth, both hands were free to handle the bees. Beekeepers of that time considered this a real advantage; however, due to their small size these smokers had problems staying lit.

Another version of this type of smoker is shown in the drawing. It was invented by G. W Hughes of Bloomington, Illinois with the patent issued on September 27, 1864. In the description, the patent acknowledges its use to control bees, but curiously the patent classification is "Insect-Destroyer." Apparently at that time there was no formal bee smoker classification. Also these smokers, sometimes called mouth smokers, were reminiscent of the pipe smokers used by European beekeepers.

Next time, we will see a huge advancement in the smoker's development with the addition of the bellows, and of course some more surprises. BC

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USING EXCLUDERS

Jim Higgins

Queen Excluders ARE NOT Bee Excluders . . . If You Use Them Correctly.

It all starts by putting Apistan or Check-Mite strips on sometime during the latter part of February. This date is determined by the chemical used and the point that it gets removed so that one or two honey supers can be put on just before apple blossom. Be sure Check-Mite is off at least 14 days before honey supers go on.

In the southern Ohio area, toward the end of March or during the first two weeks of April reverse the two brood boxes for swarm control. At this time the queen and brood are normally in the upper brood box and the lower one is almost empty. It seems ridiculous that the bees can pass through that empty brood box and not think of using it. But that's the way it is. So put it on top. Now they discover they aren't crowded at all. While you're at it look through the frames of comb and replace any you don't like (dark, broken, drone cells) with a frame of foundation. This not only gives the bees plenty of room but they also have some foundation to draw out. If there's plenty of work swarming takes a back seat in most cases.

Just before apple blossom (third or fourth week of April in Southern Ohio, most of the time) put at least one honey super on (two if you're a busy person and want to get more done on one trip). You have already removed your strips, right?

This gives the bees even more room and less incentive to swarm.

From this point on, each time you open the hive the first thing you do is check the top super and see if any nectar has been put in it. I don't care how much if there is any at all, its time for another super. (Sometimes two.)

Some people suggest you wait until the top super is 2/3 full before adding another. Nuts, you're already late. The bees have to have time to work on the comb and any foundation that may be in the super to get it the way they want it. If you don't give them the time, your honey harvest will suffer. Remember a good hive of bees during a flow can fill a super in just a few days and if it's not there it won't happen. And, they need the extra empty space to put nectar in while they are drying it. That's important!

Now let's talk about queen excluders (QE). To my way of thinking the only reason for using a QE is to keep the queen from putting brood in honey frames when it's time to extract. Queens do go up and put brood in honey supers frequently enough to be a darn nuisance so I find it desirable to use queen excluders.

I also recognize the argument that claims QE are bee excluders. I used to put the QE on top of the brood boxes as I put my first honey supers on in April and I too noticed that the bees would try to make it all happen below the QE. They were *very* reluctant to pass through the QE and like everyone else I've pondered the problem. In fact a local bee inspector and I have spent considerable time on the subject and we have solved the problem.

Now, we put the QE on at the end of June or as late as the 15th of July. We put it between the two brood boxes and put the queen down in the lower brood box.

Why then you ask?

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A Little History

Richard Dalby

From punched zinc sheets to flexible plastic grids.

The history of the queen excluder is difficult to trace in detail, particularly its origins. The concept of a device to exclude the queen from certain areas of the hive can be attributed to no one person. It seems that the first queen excluders appeared way back in the days when bees were kept in skeps. At some point in the evolution of skep beekeeping, some progressive European beekeeper hit upon the idea of adding an upper compartment for honey storage to the basic skep. These early supers not only gave the bees more room to store honey but also made it possible to remove honey without having to kill the bees in the process, as had been customary. Now appeared what was known as an adapting board. These thin boards were used as a leveling device when the crown of the skep was not level. They probably made the whole arrangement of skep plus upper chamber somewhat more stable as well and made hive manipulations easier.

These adapting boards had a round hole in the center to match the hole in the top of the skep. Somewhere along the line some clever skep beekeeper devised a grating made of wood with narrow slots which allowed worker bees to pass from skep to upper chamber but prevented

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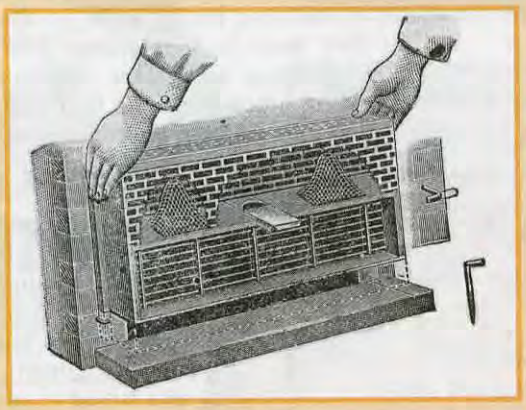
passage of the queen and drones. Adapting boards made with these narrow slots cut in the wood represent the first queen excluders. No doubt word of this new device got around and no doubt other skep beekeepers added some improvements. But at this time, before the Industrial Revolution, beekeepers pretty much had to make their own equipment.

By the middle of the 19th century, new industrial processes and materials were changing the world. Around this time someone had the idea of using a sheet of perforated metal as a queen excluder. Writing in the French magazine *LaCulture* in 1877 Charles Dadant attributed the invention of the perforated metal excluder to Abbe Collin of Paris who published a beekeeping guide in 1865. Apparently the perforations used in Collin's excluder were oblong whereas those found in English excluders of the time were circular. It was observed that the round openings tended to scrape pollen from the legs of worker bees, as well as allowing some queens to pass through. The oblong openings proved to be better than the round at allowing passage of worker bees while stopping queens and drones.



Alley Trap

Articles in the *British Bee Journal* during the 1870's indicate that some British beekeepers were using the perforated metal excluders with great success at that time. One beekeeper mentions that his bees (workers, of course) cannot pass through his perforated metal excluders with a load of pollen, a fact he likes. Another beekeeper notes that with oblong perforations measuring 1/6 by ½ inch, worker bees can pass through a metal excluder without losing their pollen. Perhaps this beekeeper was using excluder metal at the hive entrance for some purpose, which would explain his concern with pollen passing through.

We know from early editions of the *ABC & XYZ of Bee Culture* that the first perforated metal excluders used in the United States came from England. The perforations measured 9/50 of an inch in width. It was found that an occasional queen could squeeze through an opening of this size, so the perforations were narrowed to 5/32 or 8/50 of an inch in width. This proved to be too narrow and a scant 9/50 of an inch proved to be better.

Though the queen excluder originated in Europe, American beekeepers and bee supply manufacturers sought to improve on the basic idea. Dr. G.L. Tinker of New Philadelphia, Ohio, devised an excluder which used strips of perforated metal supported by strips of wood, the whole enclosed in a wooden frame. The idea was to have the strips of wood positioned above the frames, with the perforated metal strips above the spaces between the frames. This design made for an excluder that was more resistant to bending than the full sheets of perforated metal while still allowing worker bees to pass freely. In his book *Beekeeping For Profit*, Tinker's wood and metal excluder is illustrated. Other bee publications of that time picture a similar excluder attributed to prominent beekeeper James Heddon. Perhaps each arrived at the idea independently.

It should be mentioned here that zinc has long been the metal of choice for the perforated metal queen excluders. Zinc, of course, does not rust and has some manufacturing advantages. In the days when comb honey was king, the perforated zinc sheet excluders were popular with comb honey producers. But they were not perfect. For one thing, they were relatively easy to bend if stuck to the hive with propolis or burr comb. For another, since they sat directly on the top bars of the frames, they prevented movement of the bees over the top of the frames. And there was sometimes a slightly rough burr edge to the openings on the underside of the sheet which (it was thought) would fray the wings of the workers as they passed through. Some manufacturers added a metal binding to their zinc excluders to make them stronger. Others added a wooden frame which also helped. The perforated zinc excluders are still available, though many bee supply catalogs no longer list them. A new wire excluder first offered in 1908 and still around today was to prove better than perforated zinc in the estimation of most of its users.

In October of 1907 the A.I. Root Company obtained a patent on a new kind of queen excluder, put on the market in 1908. The 1923 *ABC and XYZ of Bee Culture* contains an interesting description of the new wire excluder and how it was made:

[The new wire excluder consisted of] wire bars held at the required distances apart by means of soft-metal cross-ties at every two or three inches. These bars consist of No. 14 hard-drawn galvanized wire that has been straightened in a wire-straightener so that it is as true as a die. Contrary to what one might expect, the spaces between these bars are more exact than the width of the various perforations in sheet metal. In the process of making, the bars are laid in metal forms having grooves that are spaced exactly right, and then a soft metal in a molten state is made to flow in certain cross-grooves of the metal form. As the metal cools almost instantly, the wires are held at exactly the right intervals. The smooth rounding edges of the bars afford less obstruction to the bees passing and repassing, and practical tests show that this form of excluder is much superior to the old perforated metal. On account of the rounding smooth edges of the wires, they must be slightly closer or 162/1000 of an inch.

The 1940 A.I. Root Bee Supply catalog offers both the zinc and the wire excluders in eight-frame or 10-frame sizes. The wire excluders feature a wood rim and wooden strips alternating with three-wire strips. To quote from the catalog description, "It has 10 wooden strips with 11 three-wire strips held firmly in the grooved sides of the wooden strips. They stay right. This excluder will take a lot of punishment on the hive and still remain accurate, for the wooden strips protect the wires." For those who wished them, Root offered seven-wire queen excluders built in the same fashion. These wood-and-wire excluders hark back to the wood and perforated metal excluders of Tinker and Heddon. The Root catalog points

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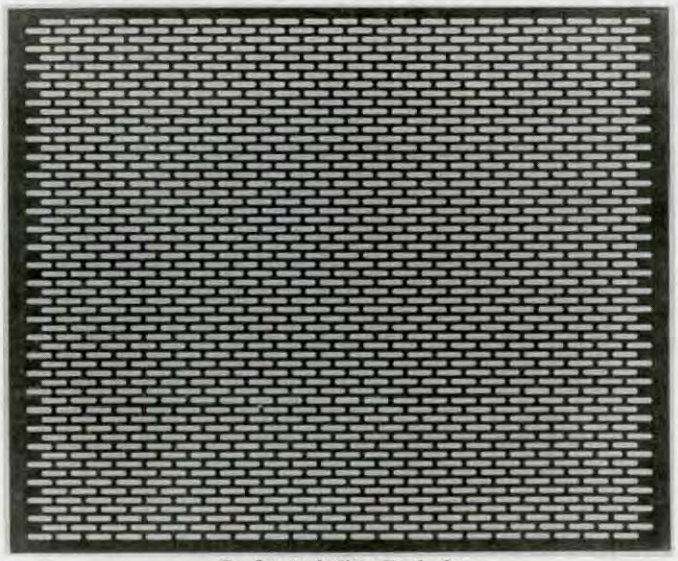
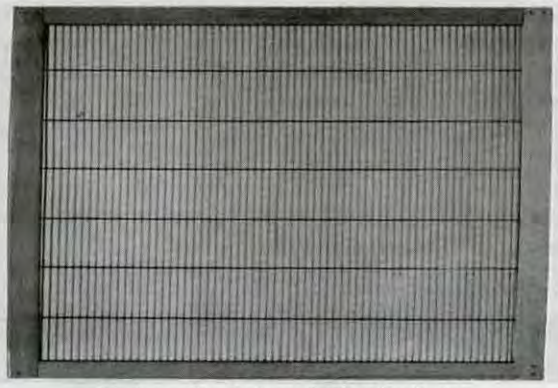
EXCLUDERS ... Cont. From Pg. 33



Perforated Zinc Excluder

Wood and Wire Excluder



Modern Wood Bound Wire Excluder

It's based on harvest. Most beekeepers in this area, to separate the light mostly clover (Summer) honey from the darker (Goldenrod) Fall honey must harvest the third week (or close to that time) of August. By confining the queen no later than July 15th all of any brood in the honey supers will have emerged, and better yet, the cells will probably be filled with honey by the time you extract.

There is one assumption when putting the QE in place. That is that there is brood in both brood boxes or at least in the upper one. Why? The brood will be cared for by the house bees no matter where it's located. By placing the QE essentially in the middle of the brood it becomes more of a step ladder than a barrier and the bees get very used to passing through it. Now nectar gets taken above it without even a second thought.

This late in the season the big urge to swarm is greatly reduced and the queen's egg laying has also diminished and there is plenty of room for her in the single deep brood box, probably even in a ¾ (IL), I haven't tried that even though my second brood box is a ¾.

I know, you're objecting because you have to hunt for the queen. *Don't worry about her*, just put the QE in place. You have at least a 50/50 chance of her being below. Now the next time you visit the hive (at least four days) check for eggs above the QE. If eggs are found, the queen can in most cases be found in the upper brood box which isn't an insurmountable task. It's best to finish this by the first of August.

Now you can harvest the latter part of August with no brood in the honey supers. If you don't have enough supers to get you to this point, you're having a good year, but I would suggest you need more supers as well.

You see, I'm lazy. I don't want to clean up the extracting facility more than twice per year.

As I harvest the lighter Summer honey, I put the supers back on the hives until the end of September to get the Fall flow as well.

When the supers come off mid to late September I put on mite strips and mouse guards (if I've been negligent and don't have the mouse guards on yet). I also treat the bees with Fumidil-B at this time.

As soon as medicating is done in the Fall I put Winter insulating boxes over each hive which are easily removed to later take out mite strips. Sometimes I wait until the mite strips have been removed to put the boxes on. The insulating boxes come off in April when the weather has warmed up and before the 15th.

Then Winter evenings are spent getting supers cleaned up and ready to go come Spring.

Try my way of using QE. I think you'll like it. BC

Jim Higgins is a sideline beekeeper from Hillsboro, OH. He often shares his beekeeping experiences with us.

HISTORY ... Cont. From Pg. 34

out that bees prefer to walk on wood and that the wood rim creates the right bee space above and below the wires. According to the 34th edition of the *ABC & XYZ*, the wood-and-wire excluders "enable the bees to pass between the wires more readily because they can grasp the wood as they pass through." These wood-and-wire excluders with the wooden strips seem to be no longer available from bee supply manufacturers. The wire excluders with wood frame (but no wood strips) are to be found in most supply catalogs today. Also to be found today in some catalogs are queen excluders made of a sheet of plastic. These plastic excluders have been popular in Europe for some time. They are somewhat cheaper than the wire excluders and supposedly easier to clean. How well they work I do not know.

For years bee supply catalogs listed a variety of devices to be used at the hive entrance to prevent drones or the queen from leaving the hive while allowing workers to leave and return. These devices came to be known as entrance guards and were fashioned of perforated zinc or wire excluder, sometimes both. Henry Alley of Wenham, Massachusetts, devised an entrance guard with a wire cloth cone in the top which would allow drones to escape through the cone but prevent them from returning to the hive. Alley improved on this idea with what was termed the "Alley trap, a two-story entrance guard with wire cones to conduct the drones upstairs where they remain trapped until dealt with by the beekeeper. Entrance guards were sometimes used to prevent swarming by confining the queen to the hive. Though still available in some supply catalogs, the once-popular entrance guard has fallen from favor. It came to be realized that these devices hinder the incoming worker bees laden with nectar or pollen. They also restrict proper ventilation of the hive and generally lower colony morale. Entrance guards may have their occasional uses but can hardly be recommended for everyday use.

The queen excluder is a device that beekeepers seem either to love or to loathe, with little middle ground. The main complaint against them is the assertion that they exclude not only queens but honey by restricting the passage of worker bees. I know of no definitive research to support or disprove this assertion. While hardly essential for the average beekeeper, the queen excluder has its uses and its defenders. Historically, excluders were popular with comb honey producers to prevent brood and pollen in the sections. And excluders are central to some commercial management systems as well as two-queen systems. Some feel queen excluders are necessary when producing the round sections, while others argue that the queen will seldom cross a shallow super of capped honey to lay above. And so it goes. Such good-natured arguments are, after all, they very stuff of beekeeping. Whatever your opinion of the queen excluder, it has been around for a long time and remains a very useful (some would say essential) piece of beekeeping equipment.

N.B. No queen excluder excludes all queens. If there are racial differences in the size of bees; if bees reared in old combs are smaller than bees reared in new comb; if nutrition can affect the size of bees; if some laying queens of the same race are smaller than others – then there can be no one perfect spacing for excluders. Any particular spacing is a compromise. BC

James E Tew

Bee Culture's Beeyard

It's April Already

Well, it's already April, and I am still planning for what I should have done this past Winter. Time flies. One day I will be completely ahead of everything, but until then I will muddle along in my own beekeeping way.

Seasonal variations are always interesting. This past February, while at a beekeeping workshop at Auburn University in southern Alabama, plants such as Flowering Quince, Dandelion, Camellia, and Japanese Cherry were already in bloom. Bees were foraging and buzzing around these early blossoms. Birds were singing and skies were blue. On that very day, I flew back to Ohio where a recent snowstorm had just passed. There was absolutely no pollen or nectar flow and you can forget the blue skies and singing birds. Environmental Shock city! But now, my Ohio Spring is approaching full swing. For my brothers in Tennessee and Alabama, beekeeping things are already considerably different.

Here in Ohio

I am still recovering from a good, old-fashioned Winter, our first in many years. We expect to suffer about a 30% loss – give or take a few hives. We frequently use beehives for non-traditional projects so we had quite a number of colonies that were undersized. Why didn't we combine colonies last Fall? Well, we took a chance that the Winter just passed would be another mild one during which lighter colonies could survive. That did not happen. In hindsight, yes, I should have combined more of the lighter colonies. Next Fall, I will combine more of the lighter hives, and I guarantee you that we will then have a mild Winter. You can thank me later.

In past articles I have written about the pleasant smells of beekeeping, but I don't recall ever mentioning beekeeping's obnoxious odors. Commercial bee repellants, smoky odors, and the sour smell of American Foulbrood are familiar. But the rotting stench of dead bees in winterkilled equipment is one I'll never take for granted.

Dead-outs

In late March and early April we take stock of where we and our hives are and lick our wounds. Dead hives are amassed and live ones are subsidized with combs of honey or with sugar when necessary. That's where the stench of dead bees arises. When no evidence of disease is present, we simply shake most of the dead bees out, install new bees on the (not too) old comb and offer as much support to the hive as is practical. Normally the bees clean the messy equipment and bee life begins anew.

Colony Splits

April is a good time to begin the process of making early season splits in northern Ohio. If we are serious about making many splits, we normally produce our own queens, a project about which I will write in detail in *Bee Culture* in May, 2003. When I was in the U.S. Army many years ago, I quickly learned that *those who do are asked to do more.* I apply the same principle to my beehives. Those hives that sur-

Dwight's home yard in early Spring.

Continued on Next Page

BEEYARD ... Cont. From Pg. 37

vive and prosper I will split, multiply and otherwise push to do even more. Next Spring, I will employ the same principle and the Spring after that, too. Those hives that don't prosper will, either intentionally or unintentionally wither away either by dying or being combined.

Swarming

Swarming is a conundrum for my brothers and me – even you I suppose. If I do all the right things, build colonies up, control diseases and pests – all the while preparing for a large nectar flow, the chances are great that these powerful colonies will swarm. I won't get most of my swarms until May, but by making splits now and requeening with hygienic queens, I will go a long way toward controlling or at least limiting swarming – plus I will reduce my mite population.

Diseases and Pests

Controlling diseases and pests is a subject for an entire book, not just an article. In my Ohio version of April, I evaluate the mite load and make my best decision on what to do about them. I could have started this process on those warm days in late March. As we strip colonies down, clean bottom boards, inspect for diseases, and reverse deeps, I can see I need to continue my process of replacing regular bottom boards with screened bottom boards.

From my brother in Tennessee

Spring begins in Ohio in April For my brother Dwight in Tennessee Spring is much further along. In April, the Tennessee nectar flow is generally well underway – even approaching half finished. Depending upon the weather and place, the Tennessee flow could start as early as late March ending in late May.

Nectar, pollen and swarming

During April Dwight's bees, located just south of Nashville in Franklin, Tennessee, actively forage on typical Spring plants such as Black Locust, wildflowers, Tulip Poplar, Dandelion, Red Bud (for pollen), and clover. This is his time to chase Tennessee swarms. Generally, swarming is frequent in April when Dwight receives about 10-20 calls per year. This year will probably be just about average. Dwight plans to split his home yard into two yards this month due to the large number of colonies in the home yard (about 20). There are several farmers within a few miles of his home bee yard who are interested in having bees on their property. He plans to move eight to 10 hives to one of these new locations. Now is a good time to do it before the colonies become heavy.

Suburban beekeeping

Living in a residential area, neighbors are always of concern for Dwight. He tries to make certain that no one is uncomfortable with his bees. Specifically, one of his neighbors, who lives two doors down, has a swimming pool filled with clean, chlorinated water. He opens his pool in April and the bees quickly find this water source. His bees are within 10 feet of a flowing stream; however, many foragers prefer the neighbor's pool water. This tends to make the neighbor cranky. Honey bribes abound in central Tennessee.

A Spring swarm on an apple limb.

Dr. John Skinner, from the University of Tennessee, plans to use 10 of Dwight's hives for a mite demonstration project that was to start in early March. Hives got mite resistant queens and screened bottom boards. Sticky boards are provided and mite counts are to be completed every three weeks. All hives in both yards will be set up for honey production and none will be rented for pollination purposes.

Colony maintenance

By now, Dwight has all the dead equipment cleaned up. Presently, he is not interested in splits, but he could still make some if he chose to. Since the nectar flow is ongoing, all mite control treatments have been off his colonies for awhile, but he will need to continue to chase his swarms. Dwight has a few screened bottom boards, but he is fortunate enough to have regular bottom boards that are painted and in good shape. He has not rushed to convert to screened bottom boards, yet.

My Brother in Alabama

Swarming

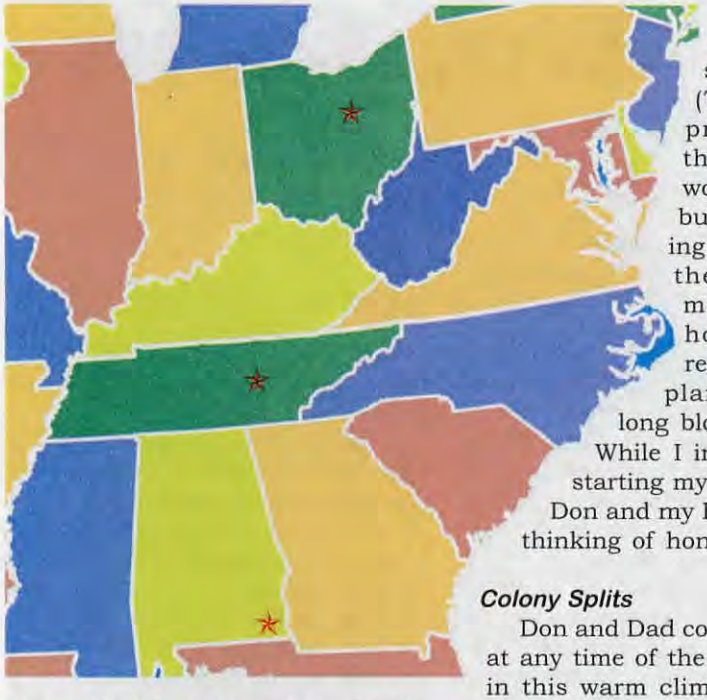
There have been signs of spring in the South Alabama air since mid-February While I write of late season cold spells, Don (working with my Dad) is actually finishing his swarm season which started in early March. Most years they pick up 20-30 swarms, many of which are from their own colonies. But during recent years, lots of these swarms have not been from their hives. They don't really know from where the bees are coming. Due to the warm climate, most of these swarms are not given loving attention but are expected to fend for themselves and prepare for an upcoming mild-climate Winter.

Neighbors

Happily, Don and I don't have Dwight's problem with neighbors. (Knock on wood). Anything can change. If it does change for either Don or me, we will start with the common method of honey appeasement for the offended neighbor. In extreme situations, we'll have to move our yards I suppose. But just now things are good with the neighbors.

Colony management

Rather than combine small colonies, Don encourages such colo-



product for human consumption (There is a privet species that produces a wonderful honey, but it isn't growing here.) Clearly, the bees don't mind Privet honey and will readily work this plant that has a long blooming season. While I in Ohio am still starting my spring season, Don and my Dad are already thinking of honey extracting.

nies to build up to mid-sized colonies (at least mid-sized). About 50% of the time Don and Dad requeen their colonies, but colonies supersede and take care of their own queen problems. This is a luxury not available to beekeepers in cooler climate. I don't have any colony statistics, but I would guess that northern colonies are somewhat larger than southern colonies – unless the southern beekeeper makes a special effort to grow a large colony.

As I mentioned in an earlier article, Don and Dad must deal with more insect hive intruders like cockroaches and earwigs, but there is no effort to control them. A strong colony will work out a reasonable relationship with these freeloaders.

The nectar and pollen flow

Don and Dad are already approaching the end of their primary flow. There may be some isolated locales where the flow is still strong, but in southeast Alabama, the nectar flow is generally waning. They don't specifically know from where their nectar flow comes. Southeast Alabama, being in a subtropical climate enjoys a diversity of wild flowering plants, but not one that particularly stands out. Gallberry, Tupelo, Tulip Poplar and clover are common producers – but not the only ones. Privet is a good producer at this time of the year, but the honey is not a high quality

Colony Splits

Don and Dad could make splits at any time of the year, but even in this warm climate, December and January would be tricky. The primary restrictions would be queen availability and drones for mating with queens. As in all areas, it is categorically better to make splits when the small colony can build up on the natural flow. If Don waits too long, he'll need to feed the splits during the hot Summer months, when bees readily fly and readily sting, it seems. The weather can really get hot and uncomfortable for the beekeeper, in southern Alabama in the Summer. Stings seem to hurt more than they should when both you *and* the bees are hot.

Dead colonies

In Alabama in April, winterkill colonies seem like something that happened years ago. Equipment has long since been cleaned up and put back into use or has been stored. Fumigation with Paradichlorobenzene (PDB) is an absolute must or wax moths will make a gigantic mess of things. Don's storage building always has a faint PDB smell whereas my and Dwight's storage building has only a seasonal smell of PDB.

Pollination services

In just a short time (late May), Don will prepare to move colonies into watermelons while I will just be coming out of apple pollination in Ohio. I will not move bees into melons in Ohio until June/early July. Same bees, same crops, but different climates.

It's the weather

The weather is always the primary difference between my brothers and my beekeeping practices. Some of us have it hotter while some have it colder. Some have it earlier while some of us have it later, but essentially, beekeeping and hive management is remarkably the same in all three locations. BC

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California Mandarins

A Seedy Tale

Joe Traynor

I have been a student of pollination for a number of years. When I first got started, I would attend meetings and read books on the subject. One of the first things I learned was that bees increased the seed set and yield of fruit with multiple ovules. There are a number of examples: apples, pears, cantaloupes, watermelons and certain varieties of tangerines.

Pictures and tables show a dramatic correlation between the size, shape and weight of a fruit and the number of seeds that fruit contains. A perfectly shaped apple, for example, will have a full complement of seeds, as will a perfectly shaped melon. Slice a lopsided fruit in half and you will invariably find fewer seeds on the puny side, more on the fully developed side. Each seed represents the union of a pollen tube from a single pollen grain with a single ovule. The more pollen that is transferred by bees, the more seeds in a fruit and the larger and more uniform the size and shape of the fruit. It was a concept I could grasp fairly easily, and one that growers could also grasp. Once grasped, it was not difficult to convince growers that more bees or stronger colonies was a good investment if high yields of well-shaped fruit were desired.

California tangerine growers bought into this concept, and 25 years ago I was paid by a tangerine grower to place bees in his grove during bloom in order to assure a good set of fruit (he had a variety that required cross-pollination to set a commercial crop). The grower was happy with his crop and received a good price for it even though the tangerines contained numerous seeds.

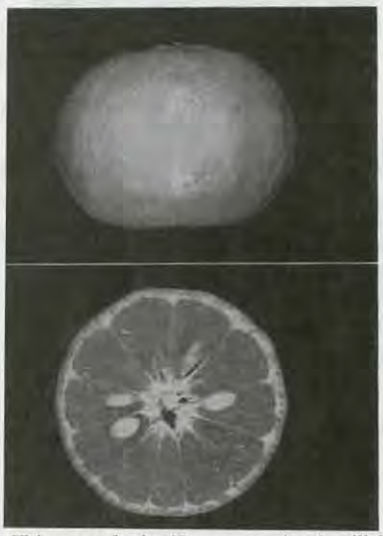
Things have changed since that time and in today's market place seedy mandarins (tangerines are in the mandarin family) are a liability – the consumer doesn't want seedy fruit. A mandarin with over two seeds is considered "seedy" by many packing houses and if they accept the fruit at all, they pay a reduced price for it. The unstoppable shift in consumer preference toward seedless produce (e.g., grapes and watermelons) makes it a whole new ball game for today's mandarin grower.

NUMBER OF FRUIT, WITH AND WITHOUT BEES

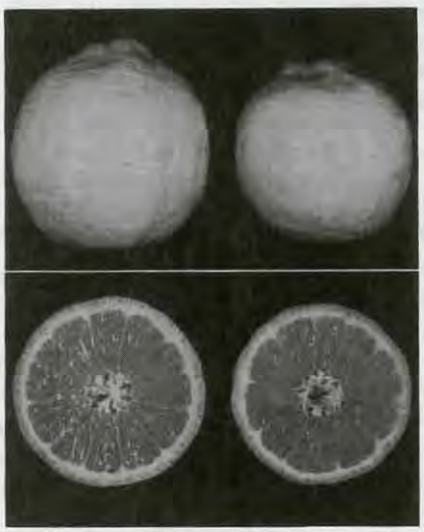
	Seedless	Seeded (Avg. # of Seeds)	Total
With bees	689	423 (3.2)*	1112
No bees	576	30 (1.2)	606

*varied from 1 to 27 seeds per fruit

from: Barbier, E. *Pollinisation et fructification du Clementinier*, Ann. Abeille, 1964, 7:63-80.



This mandarin (Encore variety) will be difficiult or impossible to sell. (photo from U.C. Bulletin 814)



This mandarin (Pixie variety) will command a premium price in the market. (photo from U.C. Bulletin 814)

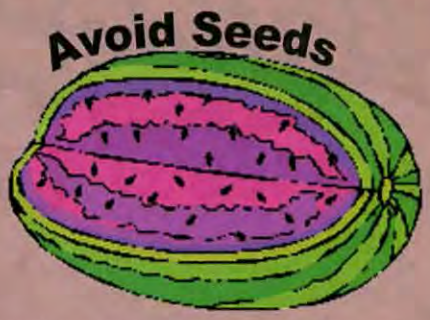
The Clementine mandarin has proven popular in recent years due to its intense flavor and zipper skin. The U.S. imports many Clementines from Spain, Morocco and New Zealand. Unfortunately, Clementine mandarins produce seeds when bees are present (although they also produce a lot of seedless fruit, even in the presence of bees – see sidebar).

California mandarin growers are now attempting to keep honey bees two miles away from their groves – a difficult task in the San Joaquin valley where citrus groves are checker boarded on the east side of the valley from Bakersfield to Fresno. Beekeepers are losing long-held locations even when not directly parked on a mandarin

SEEDLESS WATERMELONS NEED BEES

Kern county, California, is a major watermelon area. Melons are planted early each Spring so that they are harvested by the July 4 holiday market. Twenty years ago, I tried to convince watermelon growers to use bees, plying them with literature and university studies showing that watermelon fields on which bees were placed had higher yields due to the increased size of melons which in turn was due to a greater number of seeds.

All watermelon varieties had seeds at that time and most growers didn't place bees. The one grower I convinced to try bees did so for only one year because his melons got too big and the trade wanted a melon that would fit handily in a refrigerator (the monster melons of years past are difficult to find today).



Today, virtually all watermelon growers in Kern county plant seedless varieties and, ironically, all of them use bees. In order to set marketable fruit, seedless watermelons must have the stimulus of pollen. As Roger Morse put it "Apparently, pollen carried to a female watermelon flower's stigma by a bee grows and reaches the seed, but at that point the seed aborts; however the growing pollen has done its work and stimulated fruit growth (*Bee Culture*, April 2000, p. 14). There is no need to sell seedless watermelon growers on the need for bees because seed companies do the selling job for the beekeeper. Seedless watermelon seed is quite expensive and seed companies insist that growers use bees if they want a commercial crop. Quite a change from 20 years ago.

The same stimulus from pollen increases set and size on seedless mandarin varieties including an increased set of seedless fruit on the popular Clementine variety (Ann. Abeille, 1964, 7:63-80). Growers desiring this stimulus should be encouraging beekeepers to place bees by their plantings. If so, beekeepers currently treated as a pariah by mandarin growers could have growers bidding for their bees. Beekeepers could then be in the position of the "soup Nazi" of Seinfeld fame, and, if mandarin growers didn't show the proper respect, beekeepers would tell them "No bees for you! Next."

planting because the owners of the property the bees are on want to get along with their mandarin neighbors. Citrus honey is the backbone of California's bee industry and if mandarin growers are successful in displacing beekeepers, the results would be devastating to beekeepers.

Perhaps California mandarin growers took their cue from Spain where legislation in the Valencia district requires the bees to be kept three miles from any Clementine mandarin planting. In contrast, mandarin growers in Morocco have come up with a botanical solution: certain pollen producing varieties must be removed from Clementine mandarin areas.

It will be interesting to see how the current imbroglio plays out. A botanical solution seems the most likely since there are now a number of mandarin varieties that produce close to 100% seedless fruit, even in the presence of bees and other pollen sources – these seedless varieties have sterile ovules. Growers with seedy fruit can graft over to these seedless varieties. There is a precedent for such a solution: seeded grape varieties have been grafted over (or replanted) to seedless varieties. Twenty years ago many thought it impossible to develop a seedless red grape or a seedless watermelon. Today, both dominate in the marketplace over seeded varieties. Mandarin varieties that are seedless, even in the presence of bees, should dominate the U.S. mandarin market. What is needed is a mandarin with the market qualities of Clementines that also has sterile ovules. BC

Joe Traynor is a crop consultant and pollination broker in Bakersfield, California.

COMB HONEY

Step by Step How-To for Swarm Control and a Great Crop.

Lloyd Spear

I have been producing comb honey for over 30 years, and have never seen such demand as today. There were years in the 1970's when it seemed that few under age 50 even knew what comb honey was. However, since the late 1970's when more consumers started to question what they put into their bodies, the demand for comb honey has accelerated. Farmers Markets, which largely went out of business in the 1960's are starting everywhere, are hugely popular, and are selling ever-increasing amounts of both comb and locally produced liquid honey. High prices for comb honey are not a deterrent to sales as consumers are paying extra for 'LOCAL' food of all kinds. (Some are even paying in advance to support local farmers for assurance that they will be first in line to buy LOCAL produce!) Additionally, for the last couple of decades the United States has been in the midst of an immigration cycle from the Arabic countries. Per capita honey consumption (and honey prices) is among the highest in the world, and comb honey is preferred above all else. In major metropolitan areas, where those of Arabic heritage are concentrated, comb honey supply does not begin to meet demand.

Cut comb honey ready for sale.

So comb honey, like most or all LOCAL honey varieties, is today relatively easy to sell and demands high prices. That alone is good reason for production, as unused honey of any kind is wasteful. However, that is not the only reason for production by hobbyists and sideliners. After all, most do not keep beehives to make money, but instead are beekeepers for the joy of working with and learning to understand honey bees, contributing to their survival as a species, while pollinating their crops and gardens. Almost incidentally, these beekeepers enjoy some of the fruits of the bees labors, and have precious honey to give to friends and neighbors, and to sell to help pay for their endeavors. These beekeepers also are conscious of an obligation to be faithful in discharging their obligations to 'keep' bees as well as they can, so they are truly beeKEEPERS and not merely beeHAVERS. BeeKEEPERS pride themselves on helping their bees survive, prosper and build a surplus in which they can share. BeeHAVERS expect bees to survive in the artificial habitats we create. They do little to help them combat the diseases and pests for which we are largely responsible, collect from those that are successful, and replace (rather than mourn) those that die and deteriorate.

Unlike production of honey for extraction, consistent production of comb honey requires that a person be very knowledgeable of the natural instincts and behaviors of honey bees. She also needs to have a superior knowledge of the local climate and the local plants and trees as well as the timing, order and relative quantity of nectar flows. However, those beginning in beekeeping should not hesitate to try to produce comb honey because it seems daunting. To the contrary, the shortest route for a new person to become a true beeKEEPER is to immediately start producing comb honey. Accomplishment is not difficult.

After retiring from the corporate world in 1997, I was fortunate to turn my lifelong avocation, beekeeping, into a vocation. This happened primarily by purchasing the principal manufacturer of equipment to produce comb honey, Ross Rounds, Inc. This subsequently led to exposure to the comb honey production methods used by commercial beekeepers. These methods largely eliminate the principal challenge of comb honey production, swarming. I have adapted these commercial methods to small-scale production, and will share those 'secrets' with you. I will also discuss the differences in types of comb honey, how to harvest and

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COMB HONEY ... Cont. From Page 43

prepare for sale and, finally, will share some sales techniques. Along the way, I will try to remember to point out how comb honey production techniques fit into the natural order of things for honey bees.

Two types of comb honey account for over 90% of United States (and world) production. The most labor intensive, sticky, and generally more difficult is what is termed 'cut comb' This involves producing honey in an unwired frame and then cutting it into smaller pieces for sale. This requires a modest amount of specialized equipment. The other principal type is round section comb, or Ross Rounds™. The concepts for this were developed in the 1950's by an inventor in Michigan, but languished until popularized by Dr. Richard Taylor and Tom Ross in the 1970's. Dr. Taylor is a prolific author on beekeeping and frequent contributor to this magazine. After reading Richard Taylor's description of this method of producing comb honey, Tom Ross left his employment as an architect, perfected the equipment design, and owned Ross Rounds™ until it was sold in 1997 Compared to cut comb, producing Ross Rounds™ comb honey is considerably less labor intensive and messy. However, a modest amount of specialized equipment is required. One more type of comb honey is Hogg sections (after the inventor). It is somewhat less labor intensive than producing Ross Rounds™, but the specialized equipment is considerably more expensive, making the choice depends on budget, market and beekeeping style.

Round Comb Section, well filled and ready to label and sell.

In the beginning of the season, care of hives designated for comb honey production can be identical, regardless of what type is to be produced. All share a common goal, to produce a hive timed to be bursting with bees when the main flow commences. While there are many ways of doing this, I will discuss only the two that are most successful for most beekeepers. One of these is the practice used by all commercial beekeepers known to me, and the other is one I recommend for hobbyists who wish to use over-wintered hives.

It is rare to find a single method of honey bee management agreed by most commercial beekeepers, but production of comb honey seems to be an exception. While I doubt most are aware of it, every commercial producer I know uses a common spring technique to get strong hives while minimizing the risk of swarming. Simply, start a new hive with brood and bees from another, and with a current year queen.

Numerous studies have proven that hives headed by queens produced in the early Spring are reluctant to swarm. One study that I read involved several dozen hives kept in the same location and of equal strength, except that one third were headed by current year queens, one third by queens from the previous year, and one third by queens produced two years prior. Almost all of the hives headed by queens three years old swarmed, as did majority of those headed by queens produced the prior year. Yet, fewer than 10% of those headed by current year queens swarmed.

When honey bees swarm, they leave the hive with approximately 50% of the population, and the 'old' queen. Moreover, they most frequently swarm just after capping the first new queen cell. This means that no more eggs will be laid for approximately three weeks! (The three-week period consists of seven to eight days until the new queen emerges, approximately seven to 10 days until she finishes her mating flights and another two to three days before she starts laying.) That means that not only did 50% of the bees leave, but also another 20,000-30,000 bees were 'lost' because of the interruption in egg laying. A hive that swarms is 'lost' for that season to comb honey production, although it may still store some excess honey in supers containing frames with cells already drawn.

Approximately a month before dandelion bloom in your area, set up a new hive from a purchased nuc, a package, or a new queen with bees and brood from one or more of your existing hives (call this a homegrown nuc). A purchased or homegrown nuc is always preferable to a package. The reason is that nucs contain brood that will continue to emerge until almost the time that eggs laid by the new queen start to emerge. With a package, there is a two to three week period when bees naturally die, and there is no emerging brood to replace them. Consequently, when the main flow starts, hives started from a nuc will usually be stronger than hives started from packages.

If you are making your own nuc, take up to four frames with a good brood pattern from an existing hive or hives. A month before dandelion bloom it should be safe to take two frames of brood from an overwintered hive. If you want more, take the frames from more than one hive. Be certain you do not take the queen from the hives, as she or the accompanying bees would almost certainly kill your new queen. For every two frames of brood that you take from a hive, take the bees covering three frames. The easiest way to do this, and ensure that you do not take a queen, is to use a queen excluder.

While gently using your smoker, take three frames of brood from a hive, and shake or brush off almost all

the bees so that they fall on the top bars of the brood nest. Cover the brood nest with a queen excluder, put an empty hive body on top of the queen excluder, and put the frames of brood into this hive body. Do this fast, so the brood will not be chilled. Use smoke or a warm sugar water spray to keep the bees calm. If you are going to use three or four frames in your nuc, do the same thing with another hive. Put on the hive cover, and a stone, and leave. Return in six to 24 hours.

When you return you will find all the frames of brood covered with bees that came up through the queen excluder. The hives' queens, of course, are safely below the excluder. Put into your new hive as many frames of brood as you wish (up to four), together with the accompanying bees. For every two or more frames you use, shake the bees from an *additional* frame into your nuc. So, if you use two frames, give the nuc three frames of bees; if you use three frames of brood, give four of bees; four frames of brood give five of bees. Put any left over frames of brood back into the hive it came from, and fill in the space from frames of brood with frames of drawn comb. If drawn comb is not available, use foundation; in no case should you leave the space empty and invite burr comb.

In addition to the brood in your new hive, you should add enough frames so that the total number in one hive body is ***nine***. In order of preference, these should be empty, reasonably or completely full of sealed honey, or foundation. Always add at least one frame of capped honey. Two are better. Preferably, the remaining frames should drawn but empty. If not available, use what you have, including undrawn foundation. If you use undrawn foundation, the frame or frames should be in positions three through seven, but never separate brood with undrawn foundation. (Although unlikely, doing so can result in the workers producing a new queen.)

Regardless of whether you set up your new hive from a package or a nuc, to maximize comb honey production you need to feed until dandelion bloom. You can feed by adding frames of sealed honey or, and preferably, sugar syrup or HFCS. The syrup is preferable because it does not contain impurities that are not digestible. Regardless of how you feed the carbohydrates, you should also feed pollen you collected the previous year (preferably), or a pollen substitute.

You have now established a hive or hives that you expect to use for comb honey during the upcoming flow. Because you used a new queen, it is unlikely to swarm. While it has taken longer to write this than it will take you to establish one or several such hives, you have learned why swarm control is so important when you are trying to maximize hive strength. You have also learned the 'best' way of making a new hive without danger of accidentally ending up with two queens. If you are not all ready, you are well on your way to becoming a beeKEEPER and, not incidentally, enjoying a comb honey harvest. Stay tuned. BC

Lloyd Spear owns and operates Ross Rounds Equipment Company, and is a sideline beekeeper.

TOOLS OF THE TRADE

Ann Harman

Where are you going, when will you be back, and what are you taking with you?

"See you later! I'm off to my new beeyard. There's lots of Spring work to be done." And down the road you go.

Right.

By the way, your one and only hive tool is on the table by the phone.

Stop! Back up! Not only for the hive tool but to let someone at home know where you are going. Just a few weeks ago you boasted about your wonderful new beeyard. Early, mid and late nectar and pollen plants, water and no farmers nearby. And what's even better, nobody can see it from the road. All that should give the bees an early start in the Spring and, being so well protected, nobody can find it.

So what happens if you have an accident in the beeyard or get the truck stuck. Having a cell phone is certainly a big help. But last-minute instructions as to where to find you tend to be rather confusing. "You know that broken-down shed? Well, don't turn there. Go past the barn – no, not on that road. " You may need help but the helper just headed in the other direction. Without a cell phone you really have a problem, especially if it is a serious problem. Furthermore, in spite of what the ads say cell phones do not transmit very well in hilly or mountainous country. If you do have a cell phone, test it out several times on your way to your beeyard and definitely make a test phone call after you get there. (You know "Can you hear me now?")

Since you know the way to your beeyard perfectly well, leave a map and directions for those at home who don't know the way. In advance of bee season, drive the route and carefully note the mileage at certain critical points. Landmarks are helpful both on a drawn map and on written directions. Sit down some evening and carefully write down where to find you. Quickly-written, scribbled words just won't work. Is that "...turn at the barn" or does it say "...turn after the barn?" Take a test drive with a family member to see if your instructions really do make sense. I don't know how many times I've been told to "...turn left at the third traffic light" and found myself in a shopping mall. If your instructions include traffic lights, count them carefully on your test drive. If the distance between traffic lights is long, or winds for a few miles past residential areas, note that in your instructions. Simple but accurate maps and carefully written instructions may indeed provide quick assistance if needed. But let's hope it's not needed.

Now about that truck. Do you have a spare tire? Sure. Wouldn't go anywhere without one. OK. When was the last time you checked the pressure on that tire? Nothing is quite so frustrating as changing one flat tire for another equally flat tire. Country roads are notoriously rough on tires. Make your life easier – check that spare when you are checking oil and other fluid levels. Take a look at the engine belts, too. Not getting home on a hot day with a broken fan belt is not fun. Bee trucks know they have to take abuse. Be kind to yours once in a while and it will be kind to you.

It's time to review what you are taking with you. The last time you wore your veil was back in the autumn when you snagged it on a tree branch and tore a hole. Did you remember to repair that hole during the Winter? How's that helmet that someone sat on? The last time you used it, it kept falling over your face. There were Winter chores – repair helmet and veils – did it get done?

Even if you do not use coveralls and gloves, having those handy for emergencies is important. That nice gentle queen of last Summer may have mated in her youth with a nasty drone and now, this Spring, her workers are out to show you who is in control of that hive. You will also need protection for those times when you drop a frame full of bees, or even a hive body full of bees. A quick retreat to coveralls and gloves will make your cleanup work easier and definitely more peaceful.

However, another Winter project should have been to check out those coveralls. Rips and snags could have been patched at your leisure then. Gloves need to be in good repair also. Keeping a pair (or a pack of three) of those yellow rubber household gloves for emergencies is a good idea. Since some use those gloves when working Africanized bee colonies, they are certainly suitable for other crabby bees. Add a pair to your bee bucket.

And speaking of your bee bucket, let's have a look inside. Although you might put other items at the top of your list, I would like to put a First Aid Kit. These can be purchased in various stores or you can make up your own, using a child's lunch box for a container. Various sizes of Band-Aids® are essential. I always include a decent set of tweezers to remove splinters and thorns. A bottle of aspirin or other pain-killer is nice to have. And put in a good supply of those little packets of alcohol hand-wipes. You can clean a wound area with those. Think back on your beeyard injuries to decide what other items you need in your kit.

Toward the top of the list in your bee bucket should be a roll of duct tape. At one time bubble gum and baling twine held the world together. Nowadays it is duct tape. It repairs clothing, shoes, people, trucks, hives and anything else that can go wrong (except that flat spare tire).

With hive tools one of your cheapest investments, why do you have only one? (Remember, right now it's still on the table by the

TOOLS ... Cont. From Pg. 47

phone.) Archaeologists a long time from now will be able to identify beeyards not from old frames and hive parts but from a collection of lost hive tools. I have no idea why hive tools are painted red or blue. Buy some high-quality paint in "school bus yellow." That color is like nothing else in nature. Your dropped hive tool will be much more visible with a wide band of that highly visible yellow paint. School bus parking lots can be seen from 35,000 feet. That should be an indication of the visibility of that color yellow. Buy several hive tools, a few of each kind, and paint them yellow before going back to the beeyard. Save some of that yellow paint because you are going to use it later for some other things.

A good place to leave extra hive tools is under the telescoping cover of a hive. Then a hive tool is always available.

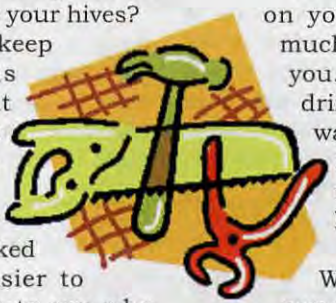
You probably have an idea of other items that constitute a useful bee bucket. A supply of colored thumbtacks is handy for marking frames and even hive bodies for some future management. One or more queen cages should also be included. A penlight is useful for looking into the bottom of cells for eggs or very young larvae. Some beekeepers like to have an inexpensive magnifying glass for that same purpose. Several handfuls of various sized nails for repairing things, and perhaps some frame lug fixers can save you a trip back home to get some, or a mess next time.

A cappings scratcher has use also, not only for opening up drone cells to inspect for *Varroa*, but also to scratch open areas of old honey that you want the bees to use up before their new honey Sweat bands for your head and boot bands for your legs are essentials for comfort. Some beekeepers like to use a frame grip – is yours clean and working well?

Some vital items – a magic marker and a pad of paper and pencil. Our memories are cluttered and short. While driving back home you will forget the one essential item you need to put in the truck for your *next* visit. You can also use the paper to leave a note under the telescoping cover of a hive to jog your memory about hive needs on the next visit. Some may wish to include a pair of scissors. A piece of aluminum screen wire and a staple gun (got extra staples?) can give you the ability to fix some piece of hive that needs ventilation instead of being sealed up with duct tape.

Now for a tool kit. Your truck may have one already but a few items may not be in it. For example, a hammer. Essential for bee hives but not terribly useful for trucks. Paint the handle school bus yellow. Your tool kit probably already has some pliers and diagonal cutters, but paint their handles also. (Aren't you glad you saved some of that school bus yellow paint?) Check the batteries in the flashlight.

Some gardening tools may well come in handy. Trees, shrubs and grass grow. Do you need some clippers or a small pruning saw to give you clear access to your hives? Include some tool to keep the grass and weeds whacked down in front of the entrance. More paint on these handles.



Paint – are your queens marked? A marked queen is not only easier to find but also indicates to you who she is – this year's? Last year's? You can buy paint pens from bee supply dealers or hobby shops and keep them in your bee bucket. You can use the international colors or choose your own color code.

Did you think to take out of the freezer some grease patties for tracheal mite control? You can find all sorts of nice, inexpensive containers at the "dollar stores" to keep and transport your grease patties. It is best to keep these in the hive all year, but some colonies gobble them up and others take their time. So you never know which hives need one right now.

The hive tool is by the phone. Remember?

Those who live in small hive beetle (SHB) areas may be using a ground drench of GardStar®. You probably mixed it at home before leaving. But did you check out the sprayer after its winter rest? It could be all clogged up with spider webs, or the gasket's shot. Check it out first.

Are you taking some queens to your beeyard? They should not be put on the dashboard or even on the seat beside you. Sun and heat are detrimental to queens and their attendants. A cooler – without ice – will carry queens nicely, protecting them from the heat of a Spring or Summer day. Yes, the air supply inside a cooler is plenty for them.

You need a supply of water on your bee truck. Not so much for the bees, but for you. It is so important to drink plenty of water on warm or hot days. Drink before you feel you need it. Don't leave home without it.

One last thing. Would you like to take a camera along? Snapshots – of your bees, the beeyard, pollen-laden bees at the entrance, the queen – are interesting, useful and, bring added enjoyment to your beekeeping. BC

Ann left her hive tool by the phone, in her home in Flint Hill, VA.

SPRING SEASON

Good Colony Management Now Means Fewer Swarms, Healthier Bees, And A Bigger Crop

James E. Tew

Well, exactly how can you be helpful?

Okay so you want to be helpful, but from what stance – yours or the bees? In an absolutely worst case scenario, you don't really have to do anything to prepare your colonies for Spring. For a while the bees will manage just fine without your involvement. But, in unmanaged colonies, you should expect annual swarms, a significantly reduced honey crop, and ultimately, colony death due to mite predation, which will require you to restock the hive with bees from somewhere else. If this "let alone" method of beehive management does not appeal to you, consider performing the following Springtime procedures.

- Give the colony space to grow during the upcoming months.
- As best you can, control diseases and pests.
- Provide supplemental foodstuffs when needed (both carbohydrate and protein).
- Requeen at least every two years (Annual requeening is not a bad idea)
- Keep your equipment maintained.

Give the colony some growing space

You can do this by removing the entrance reducer that you installed last Fall to keep the mice out. Be sure your inner cover is in the "deep side up." Finally, you can reverse deeps until the queen is freely laying in both bottom deeps.

An inner cover that had to be broken to remove.

Some Variations on my list

By April, beekeepers in warm climates are well beyond most of these events. Warm climate beekeepers would have needed to have performed these procedures in February – even January in some areas. If you haven't done them, do them all except for reversing deeps. The queen is probably using both deeps already, or they have already begun preparations to swarm.

Reversing deep supers in the Spring

I have had numerous discussions with concerned beekeepers who are trying to do the right thing with the reversing recommendation. It's actually simple. In late Winter, on those occasional warm days, or in early Spring, on those occasional warm days, open your hive. If the brood nest and most of the bees are in the top deep *only*, reverse them. That is, put the full deep, with the brood nest, on the bottom board, and put the now-empty bottom deep on top of the hive. In this way, the colony can expand in its normal upward direction. How often do you perform this reversing procedure? Once is usually enough, twice at the most. What if you discover that the queen is already using a small part of the bottom deep but is mainly using the top deep? Don't bother them. Don't change anything. Why should I be concerned about this procedure at all? Reversing deeps is purported to reduce swarming though I don't know of any specific studies proving that it does. If you don't perform the reversing procedure, don't worry about it. There are plenty of other reasons for the colony to swarm even if you do the reversing procedure.

The seasonal inner cover

General recommendations suggest that you have the deeper side of the inner cover (if there is one, and there may not be one) upward during warm months, but reverse the position during cooler months having the deeper side downward. If you must make a single decision, leave the inner cover with the deep side up year round. A crowded colony will put burr comb in the deep space within the inner cover making it difficult to remove.

Reversing the position of the inner cover during Winter months is supposed to help the Winter cluster survive more efficiently (though I don't know of any specific studies proving that it does.) There's decent

chance that the recommendations of reversing the hive bodies and inner covers are marginal tasks assigned to beekeepers by other beekeepers. I sense that controlling diseases and pests and requeening regularly may go a lot farther toward controlling swarming and producing the maximum honey crop, but there is no harm done in performing these reversing procedures.

Spring (Late Winter) Feeding, Both Cool and Warm

For you folks in warm climates, feeding colonies in April means you are probably feeding splits or swarms. If you're feeding small colonies that did not Winter well, something is wrong with that colony – but you already know that. In addition to feeding small warm-climate colonies, consider requeening these disadvantaged colonies, too. I wouldn't bother trying to feed a pollen substitute to small colonies in warm climates in April. Though they probably could profit from supplemental pollen, these colonies will prefer to gather pollen from natural sources.

For those of us in cooler climates, late Winter/early Spring feeding is not a bad idea. In fact, some of us could have started this procedure in March. How much to feed? This is a simple question that's difficult to answer. If a colony is really small and there is still some cold weather to endure, there's an excellent chance that feeding will not save the colony. No harm in trying. If the colony is in pretty good shape, feeding now might buy it enough time to get it into the Spring months. If the colony is in good shape, feeding is primarily a stimulative additive that is suppose to inspire the colony to lunge into Spring all pumped up and ready to go. (See my comments above on disease control and requeening.) No doubt, stimulative feeding a good colony in the early Spring does no harm, but I don't know how much good it does. Finally, some colonies, small or large, will take syrup at dramatically different rates. So, back to the question of how much to feed and when to stop, that depends on both you and the colony – you will have to decide. One rule of thumb – until they quit taking it.

Carbohydrate feeding

Feeding bees sugar is a time-honored procedure in beekeeping. There are many, many feeder designs. And all have advantages and disadvantages. You choose the one that fits your needs and your skill level. I have had good luck using commercially manufactured fondant. There's no liquid component and I can put the sugar patty right on top of the wintering cluster. Where can you get fondant? Either make it yourself or contact a commercial bakery. I have written about this in past articles and corresponded with many of you. There is no universal source of which I am aware. All you can do is ask around.

Pollen substitute feeding

No matter where you are, pollen substitutes should only be fed when there is absolutely no natural pollen available. Ergo, feed pollen substitute in hard Winter, long before there is any hint of Spring. By the time April has arrived, it is past time for any of us to feed pollen substitute in North America.

April in the Beeyard

- Don't let the colony become crowded – either the brood nest or the super space.
- Feed sugar, when necessary.
- Constantly monitor for diseases and pests.
- Maintain your equipment and your yard.
- Address weak colonies to determine why they are weak.
- Manage your colony's queen and replace her when in doubt.

Mineral and salt supplemental feeding

Before I go one word farther, I need to say that there are no commercial products available or any technical recommendations that suggest that you and I provide supplemental trace elements and minerals to our bees. So why am I chasing this rabbit at all? Nutritionists recommended that I take a multi-complex vitamin every day, which I do. Why should I axiomatically assume that my bees, your bees – or any bees anywhere – have access to all the nutrients that they need at all times? Honestly, I can't tell that my daily vitamin is really helping me and I suspect that most of us would have problems seeing a difference in our hypothetical nutrient-subsidized colony. But no one knows. Beekeepers long past provided small amounts of salt to their colonies in their sugar syrup. Sections in old bee books were allocated to the topic of salt-feeding colonies. Now, no beekeeper, of whom I am aware, feeds salt to their colony. My recommendation on feeding trace elements and minerals – nothing you can do. But, if you want, put a cow-lick block nearby. When it rains bees will, or won't visit it to bring back 'salty' water. It's very cheap insurance.

Feeding pollen substitute in late Winter.

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"Few things positive can be said of a crowded hive."

Splitting colonies – from one, many

April is a good time to make colony increase for most of us. It makes no sense to split a small hive so we gravitate toward the colonies that wintered well. Beekeepers in warm climates can make smaller April splits than those of us in cooler climates. Generally, about three frames of brood, mostly capped, a new queen, and a couple of frames of honey – all frames with adhering bees (shake another frame of bees (from the parent colony) in just for good measure) should be enough to get a new colony started. It is a good recommendation to feed this small colony.

A few splitting suggestions

In addition to feeding the new colony, reduce the entrance to a very small one allowing only a couple of bees to come/go at the same moment. There will be lots of confusion within the yard for the next few days after the split was made. Robbing is frequently a problem. Be certain that your feeder does not leak. Obviously a leaking feeder would attract robber bees from other colonies to your new hive setup.

A common recommendation is to place the new split on the hive stand of the parent colony and move the parent colony to another location. In this way, the split will pick up the majority of the foraging force from the parent colony. You, the beekeeper who is performing the split, will have to decide how much you parasitize the parent colony when making the split. A large split means a greater strain on the parent colony. But the better chance of survival for the split. If a honey crop is not important to you, but increasing colony numbers has priority, consider making a large split. Essentially, you will split the parent colony into halves.

If you ever doubt the safety of the new queen, recage her until you perceive the threat has passed.

Supers

You've waited pretty late, even in the Northern U.S., but get your supers ready for the spring flow. Refer to my space recommendation above. It's far, far better to give more super space than needed than to crowd the bees and miss part of the crop. Not only that, but the hive will be so solidly stuck together that it becomes difficult to open up for routine maintenance. My suggestion is to always have the top super essentially empty. Bees need space to distribute collected nectar to reduce the moisture content. In essence, few things positive can be said of a crowded hive. **BC**

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?DO YOU KNOW?

Commercial Pollination

Clarence Collison
Mississippi State University

Pollination, as a commercial business, provides the beekeeper an opportunity to increase income and build financial security. Each crop and often varieties of a crop have unique characteristics which may require different pollination approaches.

The degree to which a particular crop needs insect pollination depends on the flower morphology, level of self-fertility exhibited by the plant, and arrangement of flowers on the plant or on neighboring plants. Please take a few minutes and answer the following questions to determine how well you understand the principles of pollination.

The first thirteen questions are true and false. Place a T in front of the statement if entirely true and an F if any part of the statement is incorrect. Each question is worth 1 point, unless otherwise indicated.

1. ____ Bumble bees are superior to honey bees in pollinating greenhouse tomatoes.
2. ____ Honey bees are valuable in the pollination of crops that require buzz pollination.
3. ____ Almonds are completely self-incompatible and must be cross-pollinated with pollen from a different tree and variety.
4. ____ Dioecious plants have both male and female flowers on the same plant.
5. ____ Bees collecting nectar are more efficient pollinators than those collecting pollen.
6. ____ In watermelon pollination, as the number of seed increases so does melon weight and sweetness.
7. ____ Tomato flowers must be shaken or vibrated in order to release pollen and self-pollinate.
8. ____ In apple pollination bees prefer to work across rows rather than up and down rows.
9. ____ Inadequate apple pollination results in fruit with reduced calcium concentrations which can predispose the fruit to storage problems.
10. ____ Wind is important in the pollination of cranberry.
11. ____ Commercial carrot and onion seed production requires insect pollination.
12. ____ Honey bees are ineffective in the pollination of red clover.
13. ____ Spraying crops with a sugar-based honey bee attractant (Beelure®) encourages honey bee visitation and pollination.

Multiple Choice Questions (1 point each).

14. ____ About ____ agricultural plants grown in the United States are pollinated by bees.
    A. 130 B. 70 C. 200 D. 250 E. 325
15. ____ An apple flower has 10 ovules, and at least ____ ovules must be fertilized to have a perfectly shaped fruit.
    A. 1-2; B. 9-10; C. 6-7; D. 3-4 E. 4-5

Please fill in the following blanks. (1 point each)
A flower with both stamens and a pistil is called a (16) _____ flower. Following pollination and fertilization, ovules become (17)_____ and the surrounding ovary develops into the (18)_____.

Please match the following crop characteristics/pollination requirements with the correct crop. (7 points)

A. Squash, Pumpkin, Gourd
B. Sweet Cherry
C. Raspberry, Blackberry, Strawberry
D. Cranberry
E. Peach, Nectarine
F. Soybean
G. Sunflower

19. ____ Only one ovule per ovary needs to be fertilized.
20. ____ Ovules of some of the flowers begin to degenerate even before the flower opens; therefore, it is important that pollination occurs as soon as possible after the flower opens.
21. ____ Florets open from the head periphery inward. Florets are open for two days, a male stage on day one (pollen release) and a female stage on day two (stigma receptive), a pattern that discourages selfing.
22. ____ Anthers release pollen and the stigmas are receptive before the flower opens, resulting in autopollination.
23. ____ Flowers open early in the morning and close around noon the same day, never to reopen. Male flowers outnumber female flowers.
24. ____ Bees help deliver pollen evenly among all receptive stigmas (50-350), thus optimizing fruit weight and shape.
25. ____ For the first two days a flower is open, the anthers release pollen while the stigma remains dry, unreceptive, and hidden inside the ring of stamens. But the style keeps growing and by the time the flower has shed its pollen the stigma has become exposed, sticky and receptive.

ANSWERS ON NEXT PAGE

?Do You Know? Answers

1. **True** Bumble bees are the most important insect pollinator of tomato, especially in greenhouses. Bumble bees forage normally in greenhouses, and once released in a glasshouse, they quickly discover and work tomato flowers. Bumble bees do not fly against windows like honey bees and they are less likely to forage outside of the greenhouse when windows must be opened for temperature control. Bumble bees also work flowers when greenhouse temperatures are cool in winter and Spring. Honey bees visit relatively few tomato flowers, and because they cannot sonicate the flowers it is difficult for them to collect the pollen.
2. **False** Bumble bees and some other species of non-honey bees sonicate or buzz-pollinate blossoms by shaking pollen from the flower with high-frequency muscle vibrations. This improves pollination efficiency in relatively closed flower structures such as blueberry and tomato. Honey bees are not able to buzz pollinate flowers.
3. **True** In planning an almond orchard, it is necessary to select compatible varieties whose bloom periods overlap. Varieties should be chosen so that they bloom within three days of each other. This is necessary since almonds are completely self-incompatible and must be cross-pollinated with pollen from a different tree and variety.
4. **False** Plants with a dioecious flowering habit have only one sex of flowers on the same plant which makes cross-pollination obligatory.
5. **False** Pollen collecting honey bees are considered to be more efficient pollinators than those collecting nectar since they actively work anthers for pollen. In doing so, more pollen is deposited on their bodies and there is greater chance of making contact with the stigma.
6. **True** Watermelon, as is found in many other fruits, as the number of seeds increases within the fruit so does fruit weight or size. In addition, with melons there is an increase in sugar concentration (sweetness) associated with increasing seed numbers.
7. **True** Tomato is self-fertile and the flower must be shaken or vibrated in order to release the pollen and self-pollinate. Wind and insects provide the vibrating action necessary for self-pollination under field conditions. For plants grown in greenhouses it is necessary for growers to use mechanical vibrating devices or to bring in bees.
8. **False** Most apple varieties require cross-pollination with another compatible variety Honey bees prefer to work up and down rows rather than across rows. This is especially true in dense plantings and during even the lightest wind. One must consider this when planning the arrangement of main and pollenizer varieties in an orchard.
9. **True** Not only does adequate pollination normally result in increased fruit yields, larger fruit and better shaped fruit, in apples inadequate pollination can also reduce calcium concentrations in fruit. This is important since low concentrations of calcium can predispose the fruit to storage problems.
10. **False** Pollen release and stigma receptivity are separated in time in cranberry flowers. Therefore, insects are necessary in order to move pollen from active anthers to receptive stigmas in different flowers. Wind is not important in the pollination of the flowers.
11. **True** Both carrot and onion commercial seed production requires insect pollination. Most carrot seed set occurs with pollen transferred by insects from different plants, although a small percentage of carrot plants can set seed with their own pollen. In hybrid seed production, honey bees prefer the pollen-yielding male fertile plants over the male-sterile (female) plants. In onions, pollen must come from a different floret on the same or different umbel. An individual floret cannot pollinate itself. Cross-pollination is essential for producing hybrid seed with male-sterile lines, similar to carrots.
12. **False** Cage studies consistently show that honey bees can pollinate red clover, even though florets are more easily worked by long tongued bees in comparison to honey bees. Honey bees are the most important pollinator of red clover owing to their manageability and abundance. Although they collect pollen from red clover, getting nectar from the base of the floret can be a problem and colonies in large acreages may decline for lack of nectar. Honey bees may ignore red clover if there are more accessible/attractive nectar sources nearby.
13. **False** Bee attractants encourage bee visitation, not necessarily bee pollination. If the flowers are not appealing to bees, no chemical attractant will make bees work them. Likewise, if there are no bees in the area, an attractant will not draw them in from great distances. Sugar-based attractants are shown to actually diminish pollination efficiency because bees are diverted to collecting syrup off foliage instead of pollinating the flowers.
14. A) 130
15. C) 6-7
16. perfect or bisexual
17 seeds
18. fruit
19. E) Peach, Nectarine
20. B) Sweet Cherry
21. G) Sunflower
22. F) Soybean
23. A) Squash, Pumpkin, Gourd
24. C) Raspberry, Blackberry, Strawberry
25. D) Cranberry

There were 25 points this month. Check below to determine how you did. If you scored less than 12, do not be discouraged.

Number Of Points Correct
25-18 Excellent
17-15 Good
14-12Fair

Richard Taylor

Bee Talk

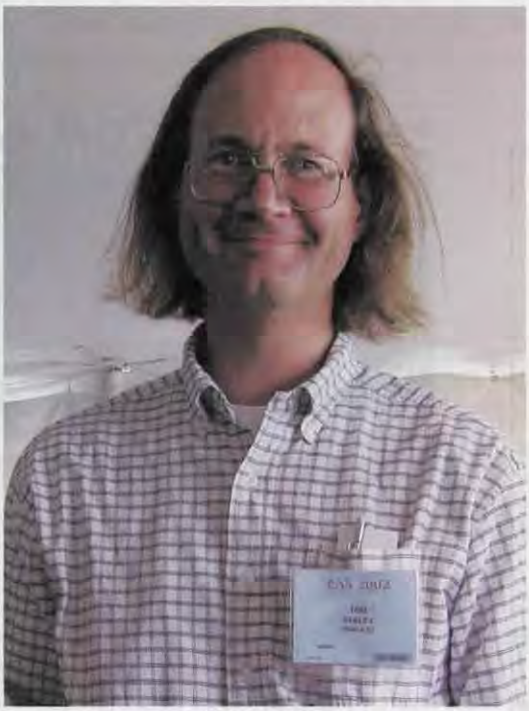
"What Dr. Seeley has discovered, building upon the pioneering work of Karl von Frisch, is so astonishing as to tax credulity."

I have devoted the last three Bee Talks to Tom Seeley's research on honey bee swarming, and now I'm going to wind up by saying something about Tom Seeley himself.

What Dr. Seeley has discovered, building upon the pioneering work of Karl von Frisch, is so astonishing as to tax credulity. Indeed, the whole subject of honey bee communication, involving dances that are correlated with the position of the sun, various pipings and other remarkable behavior patterns, has seemed, even to scientists, so bizarre as to be incredible. This research has, however, been faultlessly documented and can no longer be a matter of controversy. Any reader wanting to see this documentation may do so. Simply send me a large self-addressed envelope with $1.06 postage affixed, plus $2.00 to cover copy costs, and I'll be glad to send copies of Dr. Seeley's relevant papers.

Tom Seeley has, at age 50, had bestowed on him just about every honor and award that an academic can hope for. This was portended at an early age, when he became an Eagle Scout at 14. His record as a high school student in Ithaca, NY, made him automatically eligible for admission to any university he might apply to, and he chose Dartmouth, where he majored in chemistry and graduated with membership in Phi Beta Kappa, the nation's oldest and most prestigious honor society.

Dr Seeley was introduced to bees, quite accidentally, at age 16, when a swarm suddenly appeared in the gardens in Ithaca where he was working, and he managed to capture it. This experience, and the enthusiasm it aroused in him, led him to Roger Morse and access to the Dyce bee laboratory at Cornell while he was still in high school. Then at Dartmouth he one day came across a book by E.O. Wilson, the Harvard biologist and world authority on insect colonies, and this, in turn, led him to Harvard for his graduate studies. There it was his good fortune to find, in addition to Professor Wilson, Dr. Bert Holldobler, a visiting scholar and an ethologist in the tradition of Karl von Frisch. It would be hard to imagine a more propitious coming together of events and personalities for the shaping of his career in science.



Tom Seeley

Upon completing his doctorate Dr. Seeley received what is probably the highest honor any academic at that level can hope for, a Harvard Junior Fellowship. These bountiful grants enable a recipient to go any place in the world and pursue any kind of research for up to three years. Dr. Seeley used his to study the various bees found in Asia, combining this study with a honeymoon. After two years he returned, to accept an appointment at Yale University, where he taught and did bee research for the next six years, spending part of this time back in Ithaca, studying feral bee colonies. At the end of his tenure at Yale he moved back to Ithaca to become, at age 40, a full professor, not in the department of apiculture, where bee research is normally pursued, but in the department of Neurobiology and Behavior, where none of his colleagues are associated with honey bee research. Thus, he is considered first and foremost a biologist, whose study species happens to be the honey bee.

First, however, another generous research grant awaited him, this time a Guggenheim Fellowship

Continued on Next Page

BEE TALK ... Cont. From Pg. 55

which enabled him to take a year off from his university duties to pursue, full time, his research. This is when he wrote most of his monumental work, *The Wisdom Of The Hive*, published by Harvard University. It was not long after this that he received an offer that very few scholars in any field, the world over, would decline: A full lifetime professorship at Harvard University. Cornell, however, found ways to keep him, one of them being to supply him with a new laboratory for his research. His latest recognition has been election to the American Academy Arts and Sciences.

Dr. Seeley's research is, needless to say, fastidious, thorough and imaginative. Part of his study of swarm behavior involved marking 4,000 bees. He and an assistant did this by first chilling the bees, a few at a time, to render them temporarily inactive, then applying a tiny color-coded and numbered sticker to the thorax of each bee – a task of many, many hours. This, of course, enables an observer to follow the behavior of any individual bee over a period of time. The swarm thus created was video-taped over several hours, and then the tape was re-run, slowly and a bit at a time, and the individual motions of the bees under observation painstakingly recorded – work that kept an assistant busy for an entire Summer.

In addition to being a scientist of the highest standing, Tom Seeley is also a naturalist, in the traditional sense. He loves to be in the woods and knows the locations of at least eight bee trees in a vast wooded area nearby. These he is monitoring to see whether they survive the plague of parasitic mites – something that will be important in determining whether feral bees are developing resistance to these non-native mites. He loves being in a beeyard, and always watches the bees to see what is going on before devising his experimental tests. He has an apiary of 40 colonies, technically owned by Cornell but entirely managed by him. I was dumbfounded to learn that one warm day he took my book, *The Joys Of Beekeeping*, to his apiary and read the whole thing – a book which has not the least trace of scientific value, but instead expresses a love for nature and the bees.

One might expect someone of Tom Seeley's standing to be perhaps reserved, pompous and vain. He is in fact the opposite. It is hard to imagine him in suit and necktie, and he apparently never gets a haircut. At the EAS banquet last Summer, where over 400 people arrived dressed for the formal occasion, Tom arrived in his usual khaki shorts and hightops. He never tries to impress with his position or learning or to invite attention to himself. He doesn't need to. His achievements, at his still young age, speak for themselves. BC

Richard Taylor is a lifelong beekeeper and philosopher living in the Finger Lakes region of New York.

INNER ... Cont. From Pg. 8

sideline guys out of business. That's about $44/colony gross income. This doesn't include pollination, if done, or splits and the like – just honey. Costs aren't in this picture. The range, from 124 lbs./colony (and remember, that too is an average) to thirty something lbs., speaks of the general output in the state. (Sorry HI, you don't count for this.) Take a look at the chart. If you want, USDA has 10 years worth of data posted at usda.mannlib.cornell.edu/reports/nassr/other/zho-bb/

•

I strongly urge you to try raising some queens this season. In the past, those who ran queen production businesses would love it when we did an article on rearing queens, because then the average consumer would become aware of the difficulty, and promptly give it up.

That may still happen. It's not easy raising queens. At least good queens. Specialized equipment, precise timing, drone-adequate locations, good weather – all can raise havoc with your plans. And even if everything works, you may still end up with something less than what you wanted.

Next month, Jim Tew is going to do a 'keeper' article on this very subject. And if you follow his suggestions and guidelines and techniques to a "T", it might work. If you practice and keep trying – different locations, fine-tuning the techniques, and at different times of the year, you may, no, you will master this skill.

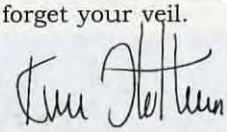
But even if you don't master it, if what you produce isn't worth the time, and even if you only do this once, you will have a far better appreciation of the job of the people you are buying queens from. You'll also be able to ask better questions, more readily recognize problems in an operation by the answers given to your questions, and be able to avoid producers who don't know the answers.

Your time and energy this year are no less valuable than last year, so even if it's for no gain and only the enjoyment of the time spent out of the office, or off the floor, raising queens has a definite positive value.

And you will be a better beekeeper. You'll better understand queen biology, drone biology, mating biology and timing and queen cells and queenless colony behavior.

Don't miss Jim Tew's article, for anything, next month.

In the mean time, be sure your smoker's lit, your hive tool's sharp, and you didn't forget your veil.



2002 HONEY ... Cont. From Pg. 13

Honey: Number of Colonies, Yield, Production, Stocks, Price, and Value by State and United States, 2002 1/

State	Honey Producing Colonies	Yield per Colony	Production	Stocks Dec 15 2/	Average Price per Pound 3/	Value of Production
	1,000	Pounds	1,000	Pounds	Cents	1,000 Dollars
AL	12	86	1,032	103	111	1,146
AZ	38	63	2,394	1,197	110	2,633
AR	55	88	4,840	1,065	124	6,002
CA	440	53	23,320	3,498	129	30,083
CO	24	60	1,440	576	122	1,757
FL	220	93	20,460	2,026	112	22,915
GA	50	52	2,600	52	110	2,860
HI	7	136	952	29	110	1,047
ID	100	57	5,700	1,653	135	7,695
IL	9	80	720	130	142	1,022
IN	8	62	496	233	114	565
IA	33	70	2,310	901	137	3,165
KS	17	52	884	407	156	1,379
KY	3	54	162	47	165	267
LA	35	124	4,340	347	114	4,948
ME	11	41	451	266	121	546
MD	3	46	138	21	175	242
MI	72	77	5,544	1,885	134	7,429
MN	117	73	8,541	1,110	142	12,128
MS	18	78	1,404	281	118	1,657
MO	18	53	954	200	137	1,307
MT	134	63	8,442	1,097	135	11,397
NE	43	75	3,225	1,161	145	4,676
NV	9	62	558	61	227	1,267
NJ	10	35	350	74	98	343
NM	11	44	484	252	109	528
NY	60	98	5,880	2,470	117	6,880
NC	14	51	714	86	136	971
ND	320	75	24,000	8,160	142	34,080
OH	16	81	1,296	518	140	1,814
OK	3	53	159	51	160	254
OR	39	49	1,911	803	128	2,446
PA	18	57	1,026	513	130	1,334
SC	5	94	470	14	125	588
SD	225	51	11,475	2,410	140	16,065
TN	8	61	488	137	137	669
TX	114	67	7,638	985	109	8,325
UT	22	59	1,298	208	129	1,674
VT	7	89	623	274	119	741
VA	7	38	266	69	186	495
WA	44	51	2,244	494	125	2,805
WV	9	51	459	151	137	629
WI	70	95	6,650	2,461	130	8,645
WY	38	63	2,394	383	139	3,328
Oth Sts4/5/	8	51	408	188	218	891
US 5/	**2,524**	**67.8**	**171,140**	**39,047**	**128.6**	**221,638**

1/ For producers with 5 or more colonies. Colonies which produced honey in more than one State were counted in each State. 2/ Stocks held by producers. 3/ Prices weighted by sales. 4/ CT, DE, MA, NH, and RI not published separately to avoid disclosing data for individual operations. 5/ Total colonies multiplied by total yield may not exactly equal production.

GLEANINGS

APRIL, 2003 • ALL THE NEWS THAT FITS

VERNON H. ADEE

Vernon H. Adee, 97 years old, of Haddam, KS died February 2. He was born March 1, 1905 at Agra, KS to Henry Herman and Myrtle Wiley Adee at a farm his parents homesteaded. They moved to Steel City, NE where in 1922 he graduated from the Steele City High School. He attended the University of NE. He taught school seven years where he met his wife, Beulah Mae Layher. They married June 10, 1932 in Broken Bow, NE and enjoyed more than 70 years of marriage.

He was a farmer/rancher in north central NE and in 1935 he also became interested in beekeeping. His father Henry had a couple hives, which supplied honey for their family of 10 children. His older brother E.H. Adee had some hives and peddled honey door to door and sold gallon and half gallon tin buckets of honey at farm sales in the depression years. E.H. helped Vernon learn the beekeeping business, starting out with a few hives and increasing his operation to 4,000 hives after moving to the Haddam, KS area. Vernon so loved beekeeping he tried to interest many young people in this occupation. Today several are beekeeper professionals because of Vernon encouraging and helping them, including his two sons, Robert and Richard, and grandsons, Bret and Kelvin Adee of Bruce, SD, his son-in-law, Robert Brown and grandson, Jerry Brown, Haddam, KS, two grandsons-in-law, Randy Verhoek, Bismarck, ND, and Larry Pape, Washington, KS.

Vernon enjoyed experimenting with innovative methods of working the bees. He enjoyed the challenges of bee breeding. Before medications for American Foulbrood (AFB) he had developed an AFB resistant bee. He was forever observing his colonies looking for those with superior traits.

His most recent experiment was the conversion of 100 colonies of bees to 100% Russian stock. He wanted to test for himself their mite resistance. He not only loved breeding bees, he was an innovator. He researched and was instrumental in helping develop a highly efficient system for the mass production of queens.

At almost 98, Vernon still kept more than 400 hives. When asked why he didn't retire, take up a hobby and enjoy life, he said, "Bees are my hobby. I love to work the bees and do research with them." So he never tired of or retired from keeping bees.

Vernon was a charter member of the American Honey Producers Association and was honored with a lifetime membership. He was the KS Director of AHPA for many years. He was President of the KS Honey Producer's Association and received beekeeper of the year award in 1985 as well as being a life member.

Vernon was also Mayor of Haddam, KS. He was a member of the Brantford Evangelical Covenant Church where he was chairman of the board, Sunday School superintendent and taught the senior high Sunday school class.

He was preceded in death by his youngest son, Stanley Vernon in a bee truck accident in 1959, his four beekeeping brothers, E.H., Joshua, Clayton and Warren; five sisters.

He is survived by his wife, son Robert (Evelyn), Bruce, SD; daughter Donna Brown (Robert), Robert, Haddam, KS; son Richard (Alice), Bruce, SD; and daughter, Vernamae Johnson (Barton), Lincoln, NE; sister-in-law, Lois Adee, Rogers, AR; 15 grandchildren, 34 great-grandchildren, six great-great-grandchildren, nieces and nephews.

THIRSTY BEES

Thirsty bees forced the closure of the swimming pool at the New South Wales coastal town of Batemans Bay.

Thousands of bees headed for the tourist town's pool after the worst statewide drought in a century dried up their usual watering holes. Officials closed the pool because of the danger of swimmers being stung as they left the water.

NSW Apiarist Association president Greg Roberts said the industry knew of the swarming problem and had successfully sought grants from the federal Department of Agriculture to subsidize the carting of water to beehives.

"This is not normal behavior for bees in the middle of a dry spell but this is a 100-year drought," Roberts said. "Waterholes in our forest which haven't been dry for a century are totally empty."

Alan Harman

FUNGUS KILLS *VARROA*

British researchers believe a fungus they have found could end the need to use chemical pesticides to control the *Varroa* mite.

Entomopathogenic fungi were singled out as the best candidates for testing against *Varroa*.

The fungi are widespread in the environment and some species naturally regulate populations of insects and mites.

They are pest specific, do not harm fish, mammals, amphibians or other wildlife, are non-toxic to humans and produce no residues that may contaminate the environment.

Entomopathogenic fungi produce spores that attach to and penetrate insect or mite cuticle, causing the host to die within three to seven days after infection. Once the host has died, the fungus produces more spores on the surface of the dead host, which subsequently spread to other hosts.

Initial work has shown that *Varroa* is highly susceptible to entomopathogenic fungi and strains of fungi have been identified that kill *Varroa* but have no effect on bees.

Alan Harman

FIRE ANT CONTROLS

Recent findings from the Agricultural Research Service's fire ant research team in FL could help find new, environmentally friendly ways to control these invasive pests that now infest millions of acres across the southern U.S.

The latest findings are part of ongoing research to control the red imported fire ant (*Solenopsis invicta*), which was accidentally introduced into the U.S. from South America in 1929. It inflicts painful stings to humans and causes ecological damage by outcompeting native ants, especially at construction sites and other areas where the soil is disturbed.

David Williams, who heads ARS fire ant research at the Center for Medical & Veterinary Entomology in Gainesville, FL, is searching for potential viruses and other biological controls against the fire ant. One is a parasitic ant from Argentina and Brazil, *Solenopsis daguerrei*, which Williams and colleagues are studying under quarantine.

This parasitic ant drains the colony's strength. Studies found that mound densities were reduced by 33% in fire ant colonies with the parasitic ant, and the number of fire ant queens was reduced by 47% in parasitized colonies.

Another potential biocontrol is the pathogen Thelohania solenopsae, discovered by CMAVE scientists in the U.S. in 1996. The single-cell protozoan parasite from South America reduces the queen's weight, causing her to lay fewer eggs.

Insect pathologist Roberto Pereira recently discovered a disease he named yellow head disease, thought to be caused by a protozoan from genus Mattesia.

Display Advertisers

I never would have gone back to Brazil just to see Africanized honey bees. I went to see Jimmy.

I didn't even hear a rumor of Jimmy for 42 years. In the sixth grade, he and I scrapped outside Rio de Janeiro's American school. When he wrote to me last winter, he wanted to talk about it.

On the plane down to Rio in August, I compensated for long-forgotten Portuguese vocabulary in a uniquely American way. I talked louder. By the time we landed, all the Brazilians in the forward section of economy class had heard about Jimmy.

They learned that after our little fight, Jimmy and I became friends. They found out he bought the seventh grade class presidency for me with Baby Ruths, Juicy Fruit, and Parliament cigarettes – all smuggled off the ocean liner SS Brasil. They learned that I left Brazil after seventh grade, and now I had to fly to Rio for a weeklong school reunion to explain to Jimmy that everything is all right, forever and ever.

The Brazilians all said, "The crime in Rio is terrible. Beware of thieves." The nice missionary lady looked up from the Book of Romans and smiled. "If you're lucky, they'll leave you standing in your underpants," she said.

In Rio I heard stories, like the time bandits held up the big tunnel that connects two main parts of the city. "Everyone who lives here has been robbed," my Brazilian classmate Suelena said.

Through a friend of a friend of a friend of a friend I'd found Walter Gressler, a retired beekeeping instructor at the Escola Wenceslau Belo, an agricultural school in Rio. When I called him from Colorado, we arranged to rendezvous the following Wednesday. He asked what my main interest was. "Africanized honey bees," I said.

On Tuesday evening I dined at the Rio home of a former classmate. We got up from the table at 1 a.m. Jimmy drove me back to my hotel like a maniac. When I remarked that he had just run a red light, he said, "Nobody stops for red lights at night. Too many muggings." By the time he dropped me off it was 3 a.m.

Four hours later, I hailed a taxi that plunged into morning rush-hour gridlock. When we finally emerged from the snarl on Avenida Epitacio Pessoa onto a crowded freeway, I mentioned I was running late. "I'll get you there as fast as I can," my affable driver replied. He tailgated, sped, swore, and cut drivers off. My seat belt wouldn't latch.

At the Escola Wenceslau Belo, Walter and I walked through lush tropical forest to reach the beeyard. Although the grounds of the school encompass 84 acres – entirely surrounded by the city of Rio de Janeiro – this Africanized honey beeyard sat only 100 yards from a city street.

Next to the hives we ducked into a little classroom. Walter said, "Write this down. Never go into a bee yard alone. Also, Africanized bees don't like dark clothing, barnyard smells, menstruating women, swishing tails, flying hair, flying shovels, pounding hammers, perfumes, smelly people. Wear clean clothes, don't walk in front of the hive, don't move your hands over the hive, don't shake the hive, avoid quick movements, and use plenty of white smoke. Too much smoke is better than not enough. Never let your smoker go out."

He paused for emphasis. "Those silly little German smokers won't do the job. You need a Brazilian smoker."

His "Brazilian smoker" was about twice the size of anything you probably ever used. Walter stuffed it with wood chips and then green leaves on top to cool the smoke. When we opened the hives, Walter not only smoked the bees – he also laid down a thick layer of smoke all around the hive.

The bees themselves behaved like, well, honey bees.

I tried to help. Walter said, "Pick up the hive covers by their edges. Underneath there could be a spider or a snake."

"This bee is Africanized," Walter said. "But this is a Brazilian bee. She combines the European bee's natural disposition to make honey with the African tendency towards making lots of brood."

Africanized Brazilian colonies produce up to 450 lbs. of honey per year in a country where migratory beekeepers find honey flows year-round.

According to Walter, Brazilian beekeepers face practically none of the serious problems endemic to American beekeepers. No foulbrood, no sac brood, no serious mite problems, no hive beetles. He did mention a poisonous pollen problem with a tree native to the Atlantic coast, but he said beekeepers got around that by feeding artificial pollen when the barbatimao tree blooms.

When I asked about Africanized bees' reputation for aggressive behavior, Walter corrected me. "Defensive, not aggressive," he said. "They only defend the hive. I don't know how it is in your country, but forty years ago, when these bees moved through Brazil, it was horrendous. They killed people and animals alike."

He explained that Africanized honey bees behave most aggressively on the frontier of their expanding range. Once these bees crossbreed with local European bees, they become much more manageable. A "hot" Africanized queen might head a colony that habitually chased intruders a kilometer or more, but after repeated crosses with European bees, her genetically watered-down progeny might be inclined to pursue you, say, only a couple of hundred meters.

"We can live with these bees," he said.

Except he almost didn't. When Walter once tried to burn an overly "defensive" colony, he instead burned a hole in his veil, and survived 129 stings.

After we finished working the bees, Walter and I went back into the classroom. Walter put his hand on the back of my zipper veil. He said, "Did you know your zipper is wide open?"

Walter showed me around the school. We looked at hogs and laying Cornish game hens and hives of stingless Brazilian bees that make a kilo of honey a year. Walter's easy way, his genteel hospitality and the strength of our common beekeeper bond touched me. He gave me a day out of his life.

Late in the afternoon Walter and I walked to the busy freeway next to the school and hailed a taxi. "Take this man to his hotel in Arpoador," Walter told the driver, "and see that no harm comes to him."

The driver pointed indignantly to his picture on his taxi license. "Sir," he said, "I am a registered taxi driver in this city."

All the way back, I fantasized being driven to some drug lord-ruled slum, where men in tattered trousers would take my money, and then I shuddered, but my driver only wanted to talk politics. "George Bush, killer," he muttered in English all the way back to Arpoador.

Part of my heart lies in Rio. I grew up there. My feelings about this place echo Walter's when I asked him his opinion of the Africanized honey bee. "I'm in favor of her," he said. "You just have to be careful."

Ed Colby

You Just Have To Be Careful